AVIATION WEEK

A McGRAW-HILL PUBLICATION

OCT. 24, 1955

50 CENTS

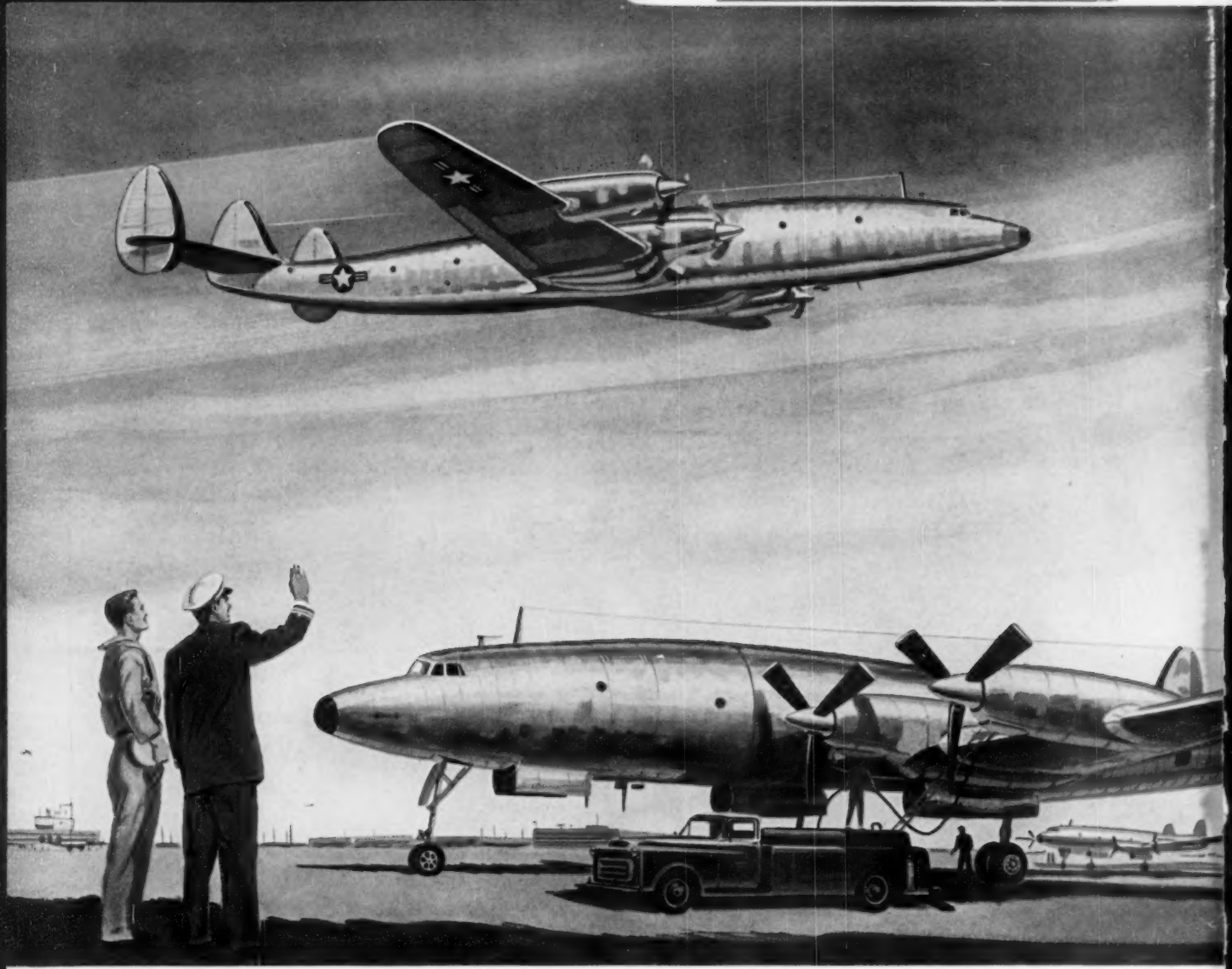
The New American Tradition... Be Prepared

Convair is now producing in quantity the supersonic, delta-wing F-102A. With this day-or-night, all-weather Interceptor the U.S.A.F. Air Defense Command will *be prepared* to better fulfill its mission – the discouraging of attack through the effective protection of America!

Through **engineering to the Nth power** Convair continues to *be prepared* to help assure peace and freedom by producing aircraft with the capabilities of the F-102A.

CONVAIR

A DIVISION OF GENERAL DYNAMICS CORPORATION



New Holley turboprop power control installed in Lockheed R7V-2

One hundred and six passengers or 36,000 pounds of cargo cruise at speeds up to 440-miles-per-hour in the Navy's new Lockheed R7V-2 turboprop Super Constellation. Four Pratt & Whitney Aircraft axial flow T-34 propeller turbine engines develop a total of 22,000 horsepower for take-off. Each of the four is automatically controlled by a new Holley gas turbine power control.

High performance turboprop engines like the T-34 demand extreme accuracy in fuel metering to maintain their high performance ratings and at the same time control operation within satisfactory limits. Through a system of accurately measuring four separate senses, the Holley control automatically meters corrected fuel flows to the engine in accordance with the engine operating requirements.

The Holley gas turbine control is the result of intensive research and development to provide a light weight, compact means of accurately metering fuel consistent with engine requirements.

This and other Holley developed fuel metering devices have played an important role in our country's undisputed leadership in the design, development and manufacture of superior aircraft.

HOLLEY Carburetor Co.

VAN DYKE, MICHIGAN

Leader In The Design, Development, and Manufacture of Aviation Fuel Metering Devices.

Need to save weight and space? Insure reliability?
Guarantee fast action? Then consider the talents of pneumatics!

Weight-saving pneumatic systems use smaller lines, require *no* return lines whatsoever. Even the heart of a pneumatic system – the compressor – aids in the task of conserving weight and space. You *store* air until it's needed, building up *high-horsepower* delivery from a lightweight, *low-horsepower* source!

Pneumatic systems give fast, efficient performance through an extremely broad temperature range. Because the viscosity of the air they use remains essentially the same from $-65°$ to $+250°$, pneumatic systems are *never* sluggish!

Pneumatic systems are dependable – face no serious leakage problem. The compressor itself automatically compensates for any minor leakage which might occur. Furthermore, since the air used in the system cannot burn, pneumatics frees you from the danger of fire!

We here at Kidde have a complete line of pneumatic system components, including high-output compressors, as well as the facilities for engineering complete pneumatic systems. If *you* have a problem in pneumatics, please write us.

Kidde
FOR PNEUMATICS

The words 'Kidde', 'Lux', and the Kidde seal are trademarks of Walter Kidde & Company, Inc.

Walter Kidde & Company, Inc., 1018 Main Street, Belleville 9, N. J. • Walter Kidde & Company of Canada, Ltd., Montreal—Toronto

Phillips 66
PRESENTS

MILESTONES IN AVIATION

Flying Aircraft Carrier

It's Performance that Counts!

For many years, Phillips *66* aviation gasolines have been top performers in planes flying in commercial and military service. Today, Phillips Petroleum Company produces tremendous quantities of 115/145 grade aviation gasoline, and also furnishes the most modern fuels for the latest designs in turbo-props and jets.

During World War II, Phillips was first to manufacture Di-isopropyl and HF Alkylate, two power-packed aviation fuel components of utmost importance to modern high-speed performance.

In aircraft fuels it's *performance* that counts. And Phillips *66* products are *outstanding* for performance!

AVIATION DIVISION
PHILLIPS PETROLEUM COMPANY
BARTLESVILLE, OKLAHOMA

In the late 1920's, the U. S. Navy carried out its first successful experiments in launching "parasite" planes from a "mother" airship, when fighters were successfully launched and retrieved by the big dirigible *Los Angeles* in flight.

Today, the U. S. Air Force has an operational *Flying Aircraft Carrier*—the giant GRB-36 intercontinental bomber which can launch and recover a "parasite" jet fighter at high altitudes.

The long range of the GRB-36 bomber, combined with the speed and firepower of the F-84F fighter bomber, adds a potent weapon to U. S. Strategic Air Power.

Phillips 66

AVIATION PRODUCTS

OCTOBER 24, 1955

AVIATION WEEK

VOL. 63, NO. 17

Editorial Offices

New York 36—330 W. 42nd St., Phone LOngacre 4-3000 (Night LO 4-3035)
Washington 4, D. C.—National Press Bldg., Phone National 8-3414
Los Angeles 17—1111 Wilshire Blvd., Phone MAdison 6-4323

PAA Order Touches Off Equipment Race..... 12

▶ BEA buys Vanguards; New York Airways, S-58s; Lockheed revises Electra; high-density DC-8 announced.

Pilots Demand Better Chance of Escape..... 31

▶ Test pilots tell industry to provide escape equipment able to keep pace with requirements of supersonic flight.

Obsolete Nav Aids Threaten Airline Prosperity..... 107

▶ IATA committee warns that outmoded navigation aids jeopardize future of international airlines.

MISSILE ENGINEERING

Details of Sperry Sparrow..... 21
New $4-Million Rocket Engine Facility 47
Britain's Napier Ramjet..... 51

AERONAUTICAL ENGINEERING

Rensselaer at United Aircraft..... 25
New Vertiplane has Conventional Look 38

AVIONICS

Helicopter Flight-Control System..... 14
Silicon Rectifiers Lighten Power Pack 55
Filter Center 57
New Avionics Products..... 59

EQUIPMENT

Hydraulics as Power Sources..... 65
Light Alerts Pilot of Power-Line Peril 73
Meter Measures Fuel in Pounds..... 78
Production Briefing 52
Off the Line 74
What's New 77
New Aviation Products 86
Also on the Market..... 91

AIR TRANSPORT

Lee Protests Short-Haul Mail Rates.. 23
Airborne Surface Mail..... 23
Ground Broken for TWA Idlewild Base 73
Slick Modernizes Ground Equipment 74
IATA Conference Roundup 108
IATA Picture Page..... 109
Lufthansa Expansion Plans..... 115
Shortlines 119
CAB Orders 119

FINANCIAL

USAF Contracts 45
Navy Contracts 45
NAA Subcontracts Total $172-Million 51

MANAGEMENT

Piasecki Stockholders to Meet..... 15
Wilson Orders Procurement Review.. 15
Report on Midge Crash..... 16
Douglas Indorses USAF Policy..... 16
ARDC Reorganizes, Tells More Secrets 17
News Digest 7
Who's Where 9, 92
Industry Observer 9

Calendar 8
Letters 81

EDITORIAL

Jet Transport Race Gets Hotter..... 122

PUBLISHER.....Robert W. Martin, Jr.
EDITOR.....Robert B. Hotz

MANAGING EDITOR.....Alpheus W. Jessup
ASST. MANAGING EDITOR (Technical) David A. Anderton
WASHINGTON.....G. J. McAllister
WEST COAST.....William J. Coughlin
ENGINEERING....Irving Stone, Henry Lefer
AVIONICS.....Philip J. Klass
CONGRESS.....Katherine Johnson
MILITARY.....Claude O. Witze
TRANSPORT.....Craig Lewis, Preble Staver
EQUIPMENT.....G. L. Christian
BUSINESS FLYING.....Erwin J. Bulban
ART EDITOR.....Lawrence J. Herb
EDITORIAL PRODUCTION...Jerome E. Kelley
EDITORIAL ASSISTANTS
Victoria Scoparino, Bernie Lang, Betty Hein
LIBRARIAN.....Jeanne Rabstejnek

FOREIGN NEWS SERVICE

EDITOR.....John Wilhelm
LONDON.....Edward W. S. Hull
PARIS.....John O. Coppock
BONN.....Gerald W. Schroder
MEXICO CITY.....John H. Kearney
RIO DE JANEIRO.....Peter Weaver
TOKYO.....Dan Kurzman
BOMBAY.....Gordon Graham

DOMESTIC NEWS BUREAUS

ATLANTA 3.....801 Rhodes-Haverty Bldg.
CHICAGO 11.....520 No. Michigan Ave.
CLEVELAND 15.....1510 Hanna Bldg.
DETROIT 26.....856 Penobscot Bldg.
HOUSTON 25.....1303 Prudential Bldg.
LOS ANGELES 17.....1111 Wilshire Blvd.
SAN FRANCISCO 4.....68 Post St.
WASHINGTON 4...1189 National Press Bldg.
Aviation Week is served by Press Association Inc., a subsidiary of Associated Press.

BUSINESS

BUSINESS MANAGER.....J. G. Johnson
PROMOTION MANAGER.....T. B. Olsen
PRODUCTION MANAGER.....W. V. Cockren

SALES REPRESENTATIVES

NEW YORK.....J. C. Anthony
CLEVELAND.....H. P. Johnson
CHICAGO and ST. LOUIS D. T. Brennan, J. S. Costello
BOSTON.....E. P. Blanchard, Jr.
DALLAS.....James Cash
ATLANTA.....William D. Lanier, Jr.
SAN FRANCISCO.....T. Evans Wycoff
LOS ANGELES C. F. McReynolds, Gordon Jones
PHILADELPHIA.....W. S. Hessey
DETROIT.....C. A. Ransdell

RESEARCH AND MARKETING

Irina Nelidow, Mary Whitney Fenton, Elinore Eisenson.

58,514 copies of this issue printed

AVIATION WEEK • OCTOBER 24, 1955 • Vol. 63, No. 17
Member ABP and ABC

Published weekly by the McGraw-Hill Publishing Company, James H. McGraw (1860-1948), Founder, Executive Editorial, Advertising and Subscription Offices: **McGraw-Hill Building, 330 West 42nd Street, New York 36, N. Y.** Publication Offices: 99-129 North Broadway, Albany 1, N. Y. Donald C. McGraw, President; Paul Montgomery, Executive Vice President; Joseph A. Gerardi, Vice President and Treasurer; John J. Cooke, Secretary; Nelson Bond, Executive Vice President, Publications Division; Ralph B. Smith, Vice President and Editorial Director; Joseph H. Allen, Vice President and Director of Advertising; J. E. Blackburn, Jr., Vice President and Circulation Director.

Subscription: Address correspondence to AVIATION WEEK—Subscription Service, 99-129 North Broadway, Albany 1, N. Y. or 330 West 42nd St., New York 36, N. Y. Allow 10 days for change of address.

Subscriptions are solicited only from persons who have a commercial or professional interest in aviation. Position and company connection must be indicated on subscription orders.

Single copies 50¢. Subscription rates—United States and possessions, $6 a year; $9 for two years; $12 for three years. Canada $8 a year; $12 for two years; $16 for three years, payable in Canadian currency at par. Other Western Hemisphere and the Philippines $10 a year; $16 for two years; $20 for three years. All other countries $20 a year; $30 for two years; $40 for three years. Second class mail privileges authorized at Albany 1, N. Y. Printed in U. S. A. Copyright 1955 by McGraw-Hill Publishing Co., Inc.—All Rights Reserved. Cable Address: "McGraw-Hill New York". Publications combined with AVIATION WEEK are AVIATION, AVIATION NEWS, AIR TRANSPORT, AERONAUTICAL ENGINEERING and AIRCRAFT JOURNAL. All rights to these names are reserved by McGraw-Hill Publishing Co.

NEW DEPARTURES OF TOMORROW

TOMORROW: Some day soon you may swing aboard an atom-powered jet aircraft and land at a Metro-Port right in the heart of your city.

TODAY: From supersonic military jets to fast-developing executive jet aircraft, New Departure ball bearings play a vital role in keeping moving parts functioning smoothly.

Maybe you'll commute from the suburbs to work on the Jetdome . . . in 1973! Then be whisked from the city's Metro-Port right to your office door. It's an idea that makes sense for tomorrow.

If a "new departure" in timesaving travel like this does take place, you can be sure that New Departure ball bearings will be on the job. Already New Departure's Aircraft Research Program is developing ball bearings for operation at speeds of over 100,000 rpm and temperatures of 500° F. or higher.

New Departure ball bearings are specified today on all forms of transportation because they hold friction to an absolute minimum, support loads from any direction, keep parts in perfect alignment, require little or no upkeep.

If your present-day product calls for future improvements, call on New Departure. You'll benefit from nearly 50 years of ball bearing experience.

NEW DEPARTURE • DIVISION OF GENERAL MOTORS • BRISTOL, CONNECTICUT

NEW DEPARTURE
BALL BEARINGS

NOTHING ROLLS LIKE A BALL

NEWS DIGEST

Bombs, Bombs, Bombs

North American's F-100C Super Sabre sweeps into the air with a total of 7,000 lbs. in bombs beneath its wings. In actual combat, bomb load could be either atomic or conventional. To increase its range, the Super Sabre is equipped with air-to-air refueling probe.

Domestic

The White House will announce the appointment of Dr. Clifford C. Furnas, Chancellor of the University of Buffalo, as Assistant Secretary of Defense for Research and Development. Dr. Furnas, former director of the Cornell Aeronautical Laboratory and director of research for Curtiss-Wright at Buffalo, will replace Donald A. Quarles who stepped up to the position of Secretary of the Air Force.

North American Aviation, Inc., is establishing a separate division to handle the company's nuclear engineering and manufacturing operations. In its announcement, North American let it be known that it plans to carve a larger niche for itself in the industrial atomic energy market. Board Chairman J. H. Kindelberger: "We now are ready to make available to friendly countries research, medical, industrial and electrical power reactors in keeping with the . . . regulations of the Atomic Energy Commission." To be known as Atomics International, the new division will be located in a $1.5-million facility in the San Fernando Valley and it will be headed by Dr. Chauncey Starr, North American vice president and general manager.

The strike-ridden American Bosch Arma Corp., manufacturers of B-52 fire-control systems, faced new problems last week. The Engineers Association of Arma, an affiliate of the Engineers and Scientists of America and one of three striking unions, placed this ad in a New York newspaper "AVAILABLE, approximately 650 engineers and technicians with broad background in the development of complex fire-control and guidance systems . . . either part-time or full-time employment will be considered." The Arma strike—its third in five years—began Sept. 30 upon the expiration of union contracts. An Engineers Association spokesman said the union will accept a 5% wage increase (it originally asked for 12%) plus an additional 2½% "inequity fund;" an Arma spokesman said it has offered to meet the 5% wage increase but that the company wants to negate certain fringe benefits now in force because they are unduly restrictive.

The tiny A4D Douglas Skyhawk holds the new world's speed record. Navy Lt. Gordon Gray flew the carrier-based attack plane at 695.162 mph. over a 500-kilometer closed-circuit course at Edwards AFB. The Skyhawk became the first attack-type plane to establish a world's speed record over the 500-kilometer course, all previous ones having been set by fighter aircraft. The best previous speed for the measured course (649.46 mph.) was set by Maj. John L. Armstrong, USAF, in an F-86H at Dayton, Ohio, on Sept. 3, 1954.

Boeing's Wichita Division last week delivered the last of an undisclosed but "sizeable" number of RB-47E jet photo planes to the Strategic Air Command. The reconnaissance version of the B-47 Stratojet is capable of high or low-altitude, 600 mph. day and night missions. First reconnaissance model of the plane was produced in 1953 under a unique program whereby B-47 bombers and photo planes emerged from the Wichita assembly line on alternate cycles. The dollar-saving move eliminated the need for training separate manufacturing crews and did away with the necessity of keeping duplicate sets of perishable and non-perishable tools. The RB-47E in its present configuration carries seven aerial cameras within its fuselage and long, equipment-packed nose.

International

Britain's Somers Kendall Aircraft Ltd. announced last week that it has flown its lightweight (810 lb.) jet SK-1 prototype. The aircraft, which presumably will be marketed as a sports plane, has been given a price tag of $28,000, or about $35 a lb. Powered by a Turbomeca Palas 350-lb.-thrust engine, the SK-1 has an assigned maximum speed of 332 mph. and an optimum cruise speed of 300 mph. Features include wing span of slightly over 20 ft., an all-moving butterfly tail, oleo-pneumatic retractable bicycle landing gear, full span flaps and tail parachute for landing.

AVIATION CALENDAR

Oct. 25-27—Technical Conference on Aircraft Electrical Applications, American Institute of Electrical Engineering, Hollywood-Roosevelt Hotel, Los Angeles.

Oct. 26—Airwork-AC Aviation Spark Plug Clinic, at International Aviation Industries, Inc., Westchester County Airport, White Plains, N. Y.

Oct. 26-28—Southwestern Airport Managers' Assn., annual meeting, Greenville, S. C.

Oct. 27-28—Aircraft Electrical Society, 12th annual display, Pan Pacific Auditorium, Los Angeles.

Oct. 31-Nov. 1—Institute of Radio Engineers, 1955 East Coast Conference on Aeronautical and Navigational Electronics, Lord Baltimore Hotel, Baltimore.

Oct. 31-Nov. 2—Society of Automotive Engineers, Golden Anniversary Transportation Meeting, Chase Hotel, St. Louis.

Nov. 2-4—Society of Automotive Engineers, Golden Diesel Engine Meeting, Chase Hotel, St. Louis, Mo.

Nov. 3-4—Institute of the Aeronautical Sciences and Canadian Aeronautical Institute, second annual joint meeting, Chateau Laurier, Ottawa, Ont., Canada.

Nov. 6-9—24th Annual National Conference of the Controllers Institute of America, Hotel Statler, Los Angeles. Robert E. Gross, president of Lockheed Aircraft Corp., will speak on "The Future of Aircraft."

Nov. 8-10—National Aviation Trades Assn., annual convention, Hotel Westward Ho, Phoenix, Ariz.

Nov. 9-10—Society of Automotive Engineers, Golden Anniversary Fuels & Lubricants Meeting, Bellevue-Stratford Hotel, Philadelphia.

Nov. 9-11—Industrial Management Society, 19th annual time, motion study, management clinics, Hotel Sherman, Chicago.

Nov. 13-18—American Society of Mechanical Engineers & American Rocket Society, annual convention, Congress, Hilton and Blackstone Hotels, Chicago.

Nov. 14-15—Aviation Distributors & Manufacturers Assn., 26th meeting, El Mirador Hotel, Palm Springs, Calif.

Nov. 14-17—Second International Automation Exposition, Navy Pier, Chicago.

Nov. 16-18—Society for Experimental Stress Analysis, annual meeting, Hotel Sheraton, Chicago.

Nov. 21-22—Symposium on Aeronautical Communications—Civil and Military, sponsored by Institute of Radio Engineers, Hotel Utica, Utica, N. Y.

Dec. 2-3—Eighth Annual Aviation Conference & Flight Clinic, sponsored by Tucson Chamber of Commerce and Tucson Airport Authority, Tucson, Ariz.

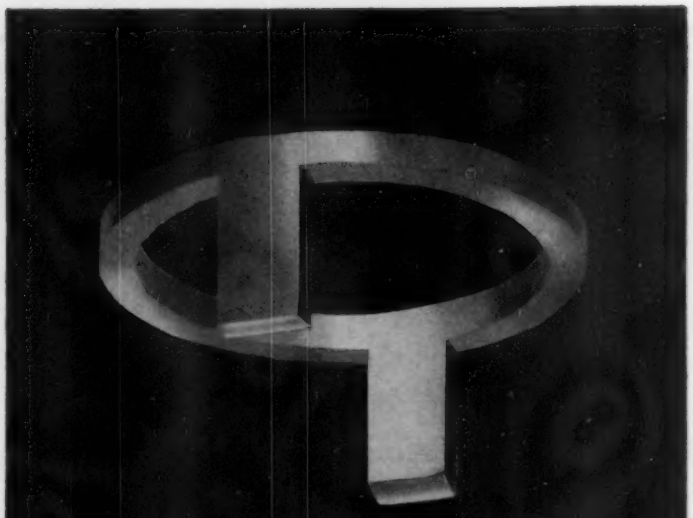
Dec. 6-7—Professional Race Pilots' Assn., convention, Carter Hotel, Cleveland.

Dec. 12-17—Nuclear Congress and Atomic Exposition, sponsored by Engineers Joint Council, Cleveland Municipal Auditorium.

Dec. 15-17—Fall Meeting, USA National Committee, URSI (International Radio Scientific Union), University of Florida, Gainesville, Fla.

PICTURE CREDITS

25, 74—Levy-Ship; 109—Aviation News Pictures.



HERE'S THE KEY

. . . to the Faster, Stronger Positive Locking of

KELOX

INSERTS AND STUDS

The simple ring shown above is the vital key to the superiority of Kelox Inserts and Studs . . . making possible these many advantages:

- Provides a positive lock between insert or stud and parent body.
- Prevents rotative action.
- Faster, easier installation and removal. No special tools.
- Gives most strength for least space.
- Allows maximum use of external threads.
- Permits application in thin plates.
- No lateral stresses — allows installations close to edges.
- Installed flush with surface.
- Special threads not required.
- Install in ferrous, non-ferrous or plastic material without dimensional changes in prepared hole.
- Most economical.
- Permits speedy removal and replacement without special tools.

Distributed exclusively in the Western half of the United States by

MONOGRAM MANUFACTURING COMPANY

A DIVISION OF INTERNATIONAL GLASS CORP.

8557 Higuera Street, Culver City, California

WHO'S WHERE

In the Front Office

C. M. Cambern elected chairman of the board of Fasteners Inc., subsidiary of Phillips Screw Co. **Judson B. Shafer** elected president and general manager.

B. Bynum Turner, executive vice president of Ethyl Corp.

Kenneth M. Bartlett, executive vice president of Horizons Inc. Bartlett was manager of research for Thompson Products, Inc.

Fred M. Glass, former aviation director of The Port of New York Authority, chief executive officer of Empire State Building Corp.

Honors and Elections

Oliver A. Rosto, 73, liaison representative for Transocean Air Lines, received a Civil Aeronautics Administration medal for distinguished service to world aviation. Rosto was a CAA inspector prior to his retirement in 1953.

John H. Gibbs, Lockheed Aircraft Corp., named chairman of Aircraft Industries Assn. committee on packaging and preservation; **R. W. Shirk,** Allison Div. of General Motors, appointed vice chairman.

Andrew F. Hillhouse, Solar Aircraft Co., appointed vice chairman of Gas Turbine Power Div., Washington section of American Society of Mechanical Engineers.

Changes

Dr. Charles G. McIllwraith, research director of Bill Jack Scientific Instrument Co., Solana Beach, Calif.; **Clarence E. Forbes,** manager of Technical Employment and Training.

Dr. Alberto F. Thompson, chief of Office of Scientific Information of the National Science Foundation; **Clyde C. Hall,** public information officer.

Robert D. Elbourn, chief of Components and Techniques Section of National Bureau of Standards.

Vernon G. Crudge, special aviation consultant to Boeing Airplane Co.

George G. Hyde, patent attorney for the Pioneer-Central Div. of Bendix Aviation Corp. **Forrest L. Dunbar,** industrial relations director of Bendix Products Div.

James E. Boyce, commercial sales manager of California Div. of Lockheed Aircraft Corp.; **Thomas F. Bergmann,** formerly sales manager of Wright Aeronautical Div., Curtiss-Wright Corp., joined commercial sales staff.

William W. Vogel, chief of sales engineering and flight test dept. of LearCal Div. of Lear, Inc.; **Earle Gardiner** replaces Vogel as national service manager.

Paul Bailey, sales manager of Camair, Div. of Cameron Iron Works, **Roy Thorson,** sales representative; **Hugh I. Gillham,** assistant chief engineer; **Harry H. Walsh, Jr.,** production superintendent.

Kenneth O. Smith, former news bureau manager, public relations director of Western Air Lines; **Bert D. Lynn,** advertising and sales promotion director.

(*Continued on p. 92*)

INDUSTRY OBSERVER

► F5D fighter which Douglas' El Segundo Division is building for Navy is a refinement of the F4D with thinner wing and tail, longer fuselage and higher fineness ratio. First F5D probably will come off the line early in 1956.

► General Electric has a ducted fan engine in advance development. In the 10,000 lb. thrust category, it will be small enough for retrofit into current operational aircraft.

► Hughes Aircraft Co. and Sperry Gyroscope Co. reportedly have won the hotly contested competition for development of fire control systems suitable for long range interceptors.

► Successor to the Glenn Martin P6M SeaMaster on the company's drawing boards is known as the SeaMistress. U. S. flying boat proponents, stimulated by Air Force interest in the new jet-propelled aircraft, are pushing for faster development. A major matter of concern is the possibility that Great Britain will outpace U. S. progress in the field.

► Atomic Energy Commission and USAF are consulting CAA Medical Division on the possibility of using commercial airliners to take samples of the atmosphere for study of radioactive particle count.

► Several military avionics equipment manufacturers are eyeing the growing business aircraft market for communications, navigation and flight control equipment. Interested companies include A. C. Spark Plug Division of General Motors, and the Crosley Division of Avco Manufacturing Co.

► An instantaneous vertical-speed indicator employing inertial devices to eliminate lags encountered in the long-used conventional rate-of-climb indicator, is under development at Summers Gyroscope Co.

► The airlines are soon to get a look at a radically improved altimeter that gives instantaneous readings to a guaranteed overall accuracy of 1 part in 3,000—equivalent to between five and 10 ft. at sea level and 40 to 50 ft. at 45,000 ft. altitude. This could make more room in crowded air space. High accuracy and sensitivity of the system are due to specially designed aneroid capsules operating in a system that eliminates friction-producing bearings and gear trains between sensing element and indicator.

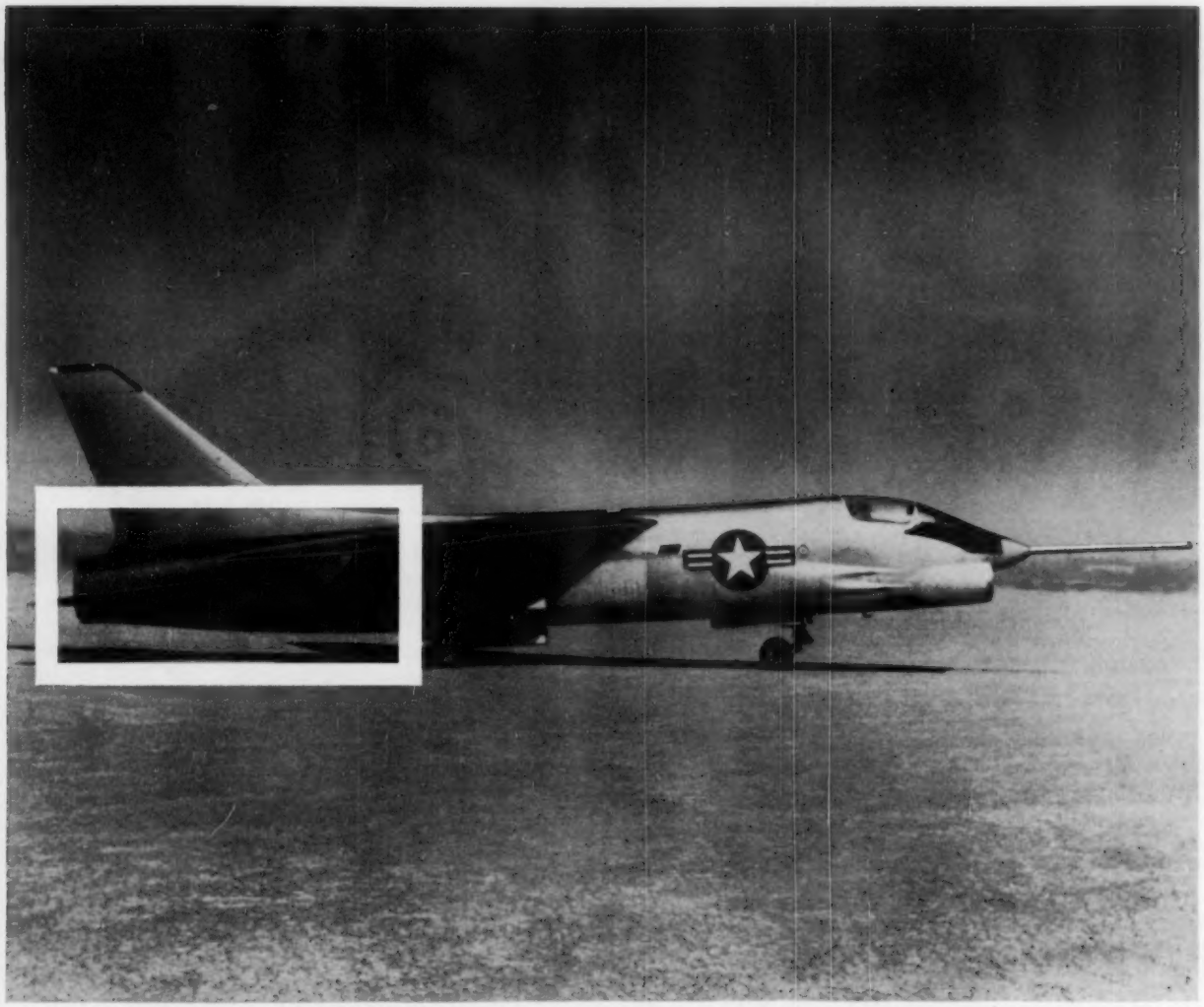
► Hughes Aircraft Co. has moved to diversify by forming a new commercial products division. It will exploit military avionics developments which have commercial and industrial automation possibilities. Hughes also hopes to sell its new storage-type cathode ray tube to airlines for use in weather radar and air traffic control signalling systems. Semiconductor diodes are the only present Hughes commercial product.

► Vickers-Armstrongs expect to boost the speed of its Viscount series from the current 328 mph. to 365 mph. by the use of the ultimate development stretch version of the Dart turboprop. This Rda. 8 development is expected to boost Dart power to over 2,100 eshp. through component efficiency improvement.

► Aircraft certificated for dusting and spraying now total more than 4,200. Flying for this purpose should hit new record in 1955 with 3,180,000 acres of forest already covered in fight against gypsy moth and 1,600,000 acres sprayed to control grasshoppers.

► Rolls-Royce Conway turbofan engine is now running its official type test aimed at producing a rating of 13,000 lb. for commercial applications. Military thrust ratings of the Conway are considerably higher.

► Pilots of the South African air force will be trained in Canada to fly the Canadair-built Sabre F-86 Mark 6 fighter. When delivery of 37 planes on order is started next April, first trainees will start ferrying aircraft to South Africa until two squadrons are equipped. Order is worth $10 million.



TITANIUM and the "hot end" of the XF8U-1

Engine and aerodynamic heat team up to make the aft section of the Navy's Chance Vought XF8U-1 *really hot.*

That's why there are hundreds of pounds of titanium in the "hot end" of this fast, new, carrier-based jet fighter. For each of titanium's remarkable properties has a direct effect on over-all performance: its resistance to heat, coupled with high strength-weight ratio . . . its unusual ability to withstand corrosion, and salt-air pitting . . . its freedom from stress-corrosion cracking.

REM-CRU, a leading producer of titanium, led in the development of titanium alloys for aircraft applications. Now, its greatly expanded facilities insure *prompt* delivery of REM-CRU titanium in all standard mill products . . . in a wide variety of sizes, shapes and grades, including the new high-strength, weldable alloys. And REM-CRU's enginering staff has available extensive information on titanium's performance in practically every type of aircraft—it's at your service.

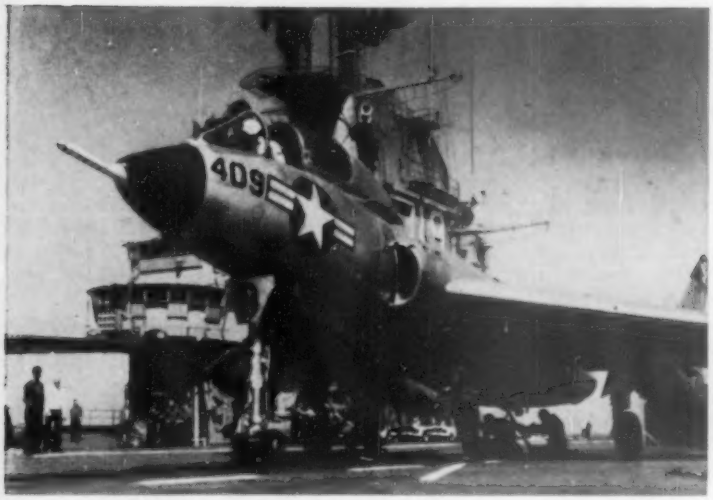
To keep abreast of the latest developments on this vital metal, write to Dept. A10 for the Rem-Cru Review—a free periodical presenting the latest technical data on titanium alloys.

REM-CRU TITANIUM

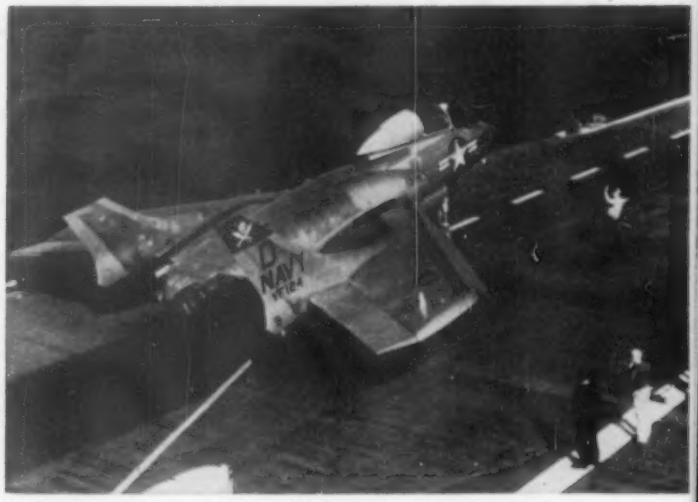
REM-CRU TITANIUM, INC., MIDLAND, PENNSYLVANIA

New Look for Carriers:

Steam Catapults, Mirror Landing Device



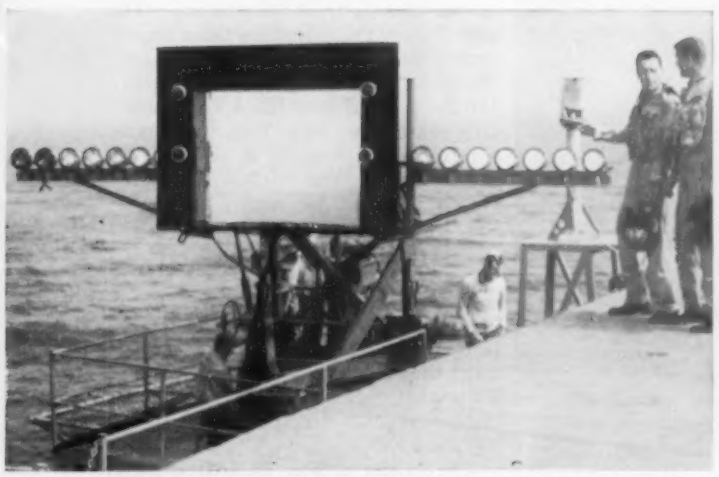
ABOARD Hancock, F7U-3 is rolled to new-type steam catapult . . .



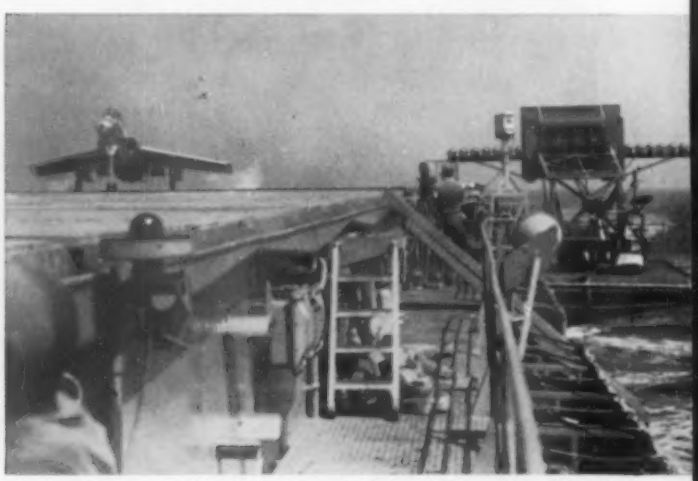
GROUND crew makes hookup with catapult and gives ready signal. . . .

STEAM rolls up as catapult prepares to shoot F7U-3 off deck . . .

GOING full force, catapult sends Cutlass down deck for takeoff.



NEW landing system (concave mirror and lights) on Bennington . . .



Gets first test as F7U-3 lands. Unit indicates glide path, altitude.

AVIATION WEEK VOL. 63, NO. 17
OCTOBER 24, 1955

PAA Order Touches Off Equipment Race

BEA buys Vanguard; New York Airways, S-58s; Lockheed revises Electra; tourist DC-8 announced.

The international air transport industry buzzed with new equipment deals last week in the wake of the record $269-million jet airliner orders placed by Pan American World Airways (AW Oct. 17, p. 7).

As U. S. and British airframe and engine manufacturers swarmed around the fringes of the 11th annual general meeting of the International Air Transport Association in New York, the following developments occurred:

• **Vickers-Armstrongs** sold more than 20 new 93-passenger Vanguard transports to British European Airways. The Vanguard (V.900) will be powered by four Rolls-Royce RB 109 turbo propellers. Final negotiations on quantity and price of the BEA order are now under way.

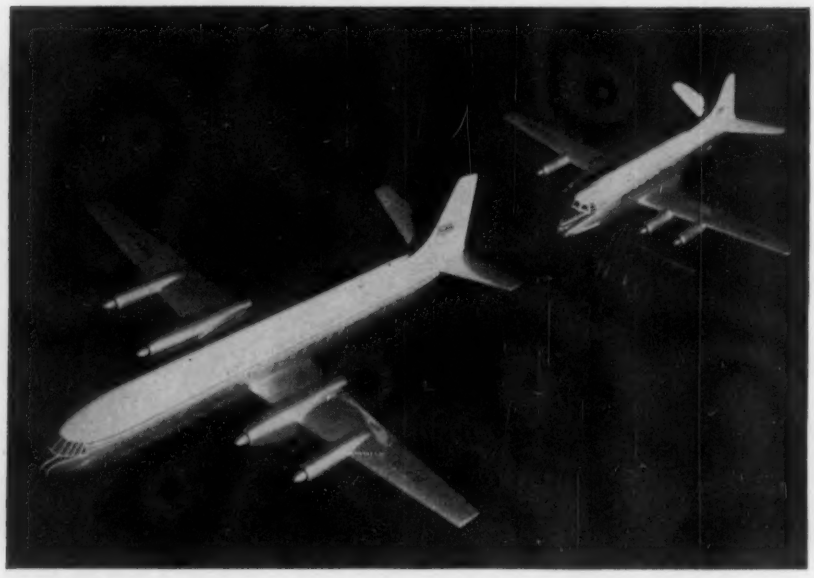
• **Sikorsky Aircraft** sold seven S-58 helicopters to New York Airways for $2 million. Another sale of an unspecified number of the 12-passenger helicopters to Sabena, Belgian National Airline and international transport helicopter pioneer, will be officially confirmed in the near future.

• **Lockheed Aircraft Corp.** has released the latest revised design of its Electra turboprop transport (AW June 13, p. 12) to the production department at its Burbank plant. New Electra design features a triangular vertical fin, larger wing span, higher gross weight, larger payload and longer range.

• **United Aircraft Corp.** revealed that the Pratt & Whitney J75 split compressor turbojet aimed at 15,000-18,000 lb. thrust will be available in commercial versions of the Douglas DC-8 and Boeing 707 jet transports. F. B. Rentschler, UAC chairman, said the military version of the J75 will be in production next year and reach military service by 1957 to provide two full years of operational experience before initial commercial deliveries are made in 1959.

• **Boeing Airplane Co.** flew its model 707 transport prototype on a spectacular transcontinental roundtrip in 8 hr. and 16 min. The 707 piloted by A. M. (Tex) Johnson flew the 2,040 nautical-mile stretch from Seattle to Washington, D. C., in 3 hr. 58 min., averaging 592 mph. and returned to Seattle in 4 hr. 8 min. Top speed recorded was 615 mph. The 707 cruised between 33,000 and 35,000 ft. altitude and maintained cabin pressure of 8,000 ft. It carried 74,000 lb. of fuel and had 10,000 lb. remaining on landing at Washington.

• **Douglas Aircraft Co.** revealed a high-density version of its DC-8 jet transport that can carry 131 tourist-fare passengers on the nonstop trans-Atlantic hop. The high density DC-8 features three abreast seating on both sides of the center aisle. Douglas said the DC-8 will carry a 31,110 lb. payload over the 3,320 statute-mile route from New York to Paris in 6 hr. 25 min., cruising at altitudes between 30,000 and 40,000 ft. at an average speed of 556 mph.



MODELS show size increase of new Vickers Vanguard (foreground) over Viscount 700.

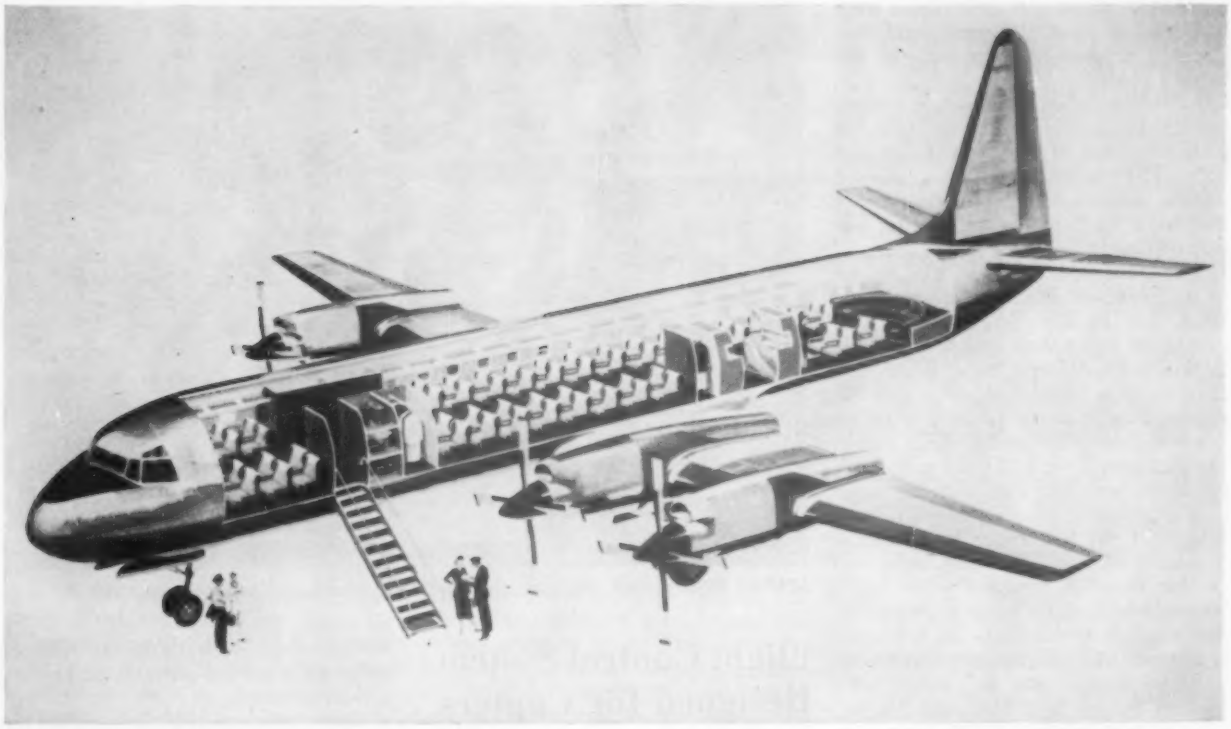
SIKORSKY S-58, 12-passenger helicopter has been purchased by New York Airways.

BEA Buys Vanguard

British European Airways firmly linked its future to Vickers-Armstrong turboprop aircraft with the announcement that it will buy a fleet of Vickers Vanguards, newest and biggest of the turboprop series which started with the Viscount.

The carrier is now in final negotiation for an order of 20 to 25 Van-

ing 90 passengers over 2,500 miles stage length of at least 400 mph., and that



REVISED Lockheed Electra interior (four-abreast seating) is shown in artist's drawing. New Electra has greater range, payload.

guards powered by 4 Rolls-Royce RB 109 split-compressor turboprop engines.

Delivery of the Vanguards is scheduled for 1959-60. The order for the new airplane, plus new and current orders for 800 series Viscount Majors, represent BEA's equipment plans well into the 1960's.

BEA believes that possibly within three years it will have an all-turboprop fleet, with the exception of aircraft needed for small operations in Scotland. If a small turboprop, such as the Fokker F-27, could be found that satisfies BEA, the carrier could have an all-turbine operation within three years.

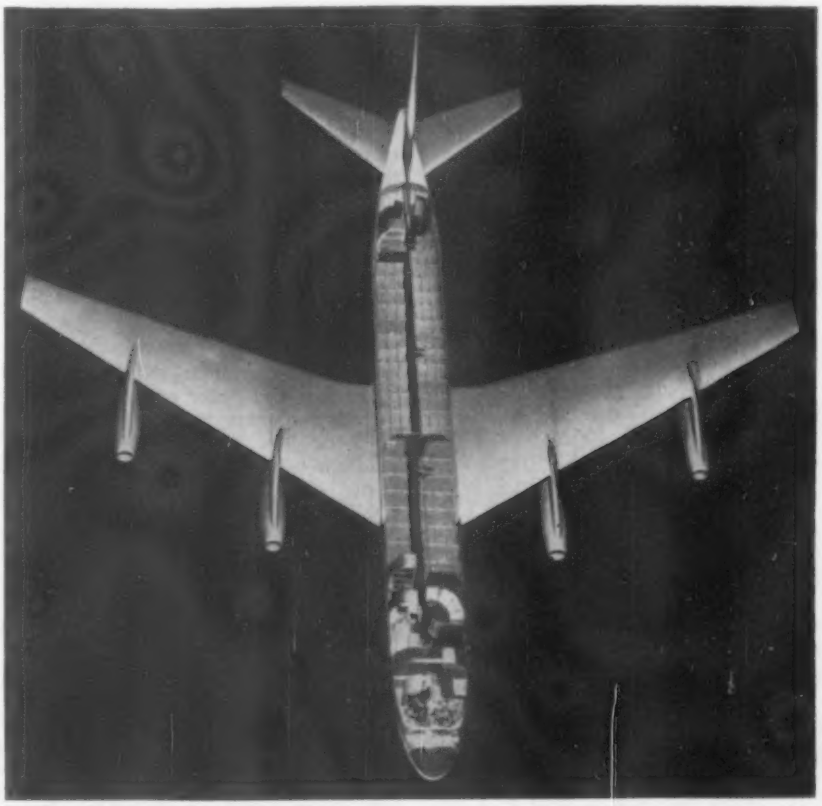
Vanguard Statistics

The new Vanguard was designed by Vickers to meet detailed BEA specifications for a short and medium-haul transport. It is a mid-wing, four-engine design and will carry 93 passengers in the BEA configuration (five abreast seating).

A "double-bubble" fuselage will be used with the upper part divided into three passenger compartments. Two luggage and freight holds are in the lower part. Vickers has 105-passenger version it is offering to other airlines.

Performance of the Vanguard is tied to development of the Rolls-Royce RB 109 engine that will power it. Initially, it will be a 4,470 eshp. engine, and the airplane will cruise at 400 mph. As RB 109 power is increased to 5,000 eshp, cruise speed will go to 425 mph.

Vickers and BEA believe the Vanguard has an ultimate potential of carry-



DC-8 CUTAWAY model on display during IATA meeting shows five-abreast seating in forward compartment; six-abreast in rear. Model also gives good planform view.

ing 90 passengers over 2,500 miles stage length of at least 400 mph., and that it could be operated over 86% of the world's routes.

Rolls-Royce has been bench testing the RB 109 and plans its first flight test early next year in a Lincoln flying test bed. The engine has been designed around an axial-flow split compressor that has a 12 to 1 pressure ratio for low fuel consumption.

The Vanguard, which will be similar to the Lockheed Electra, is designed for short and medium hauls and is not capable of flying such long-haul services as the North Atlantic route. BEA's sector average is about 500 miles, and the carriers longest route—London to Rome—is less than 1,000 miles. BEA thinks the Viscount Vanguard series will satisfy its needs well into the next decade.

To supplement the high density Vanguard, BEA is ordering additional Viscount Majors. The new order will be for the 806 powered with Rolls-Royce Dart R. Da.7 engines. With the new engines, it will cruise at 360 mph. It is expected by September, 1957.

BEA already has an order with Vickers for 88 802 Viscount Majors. This aircraft, expected to fly next year, is powered with the Dart R. Da.6 engine and will cruise at 320 mph. with 65 passengers.

Vickers plans to develop the 800 series into 1959 and will have a speed of 400 mph. The 700 and 800 series will be manufactured together, starting next year. Production of the Vanguard will begin now and the first aircraft off the line will be used as a prototype by Vickers.

S-58 Order

New York Airways' seven Sikorsky S-58s (costing $2,000,000) are scheduled for delivery starting early next spring.

Delivery of the aircraft will give New York Airways the largest helicopters operated in scheduled service anywhere. The aircraft will be added to the carrier's current fleet of five Sikorsky S-55's.

The S-58 will be powered by a Wright R-1820 engine, providing 1525 hp. It will cruise at 105 mph. and carry twelve passengers. Lifting power will be 4,000 lb.

Performance of the S-58 is a substantial increase over that of the S-55 which has a 600 hp. engine, cruises at 85 mph. and carries five passengers.

"All of these benefits will be passed on to passengers in speedier service, greater capacity and even more convenient schedules than now prevailing," NYA president Robert L. Cummings said after announcing the order.

"This will mean that present airport hourly schedules will be shaved to half-hourly operations."

SPERRY flight-control unit hovers helicopter off ground. No hands are on controls.

Flight Control Systems Designed for Copters

The development of a 60 lb. automatic flight-control system, believed to be the first capable of stabilizing flight path and heading as well as maintaining constant altitude and airspeed, was announced last week by the Sperry Gyroscope Co., Division of Sperry-Rand.

The new system which will increase the helicopter's all-weather capability, is scheduled for production in December (AW Oct. 17, p. 7). Sperry officials say the unit is a forerunner of a new set of simplified helicopter flight instruments it plans to produce.

The lightweight system provides five channels of automatic control.

They are:

- **Heading,** by controlling "rudder" pedals.
- **Airspeed** and pitch stabilization, by controlling the cyclic pitch stick.
- **Bank and turn,** by controlling cyclic pitch stick.
- **Barometric altitude** by controlling collective pitch.
- **Rotor rpm,** by controlling engine throttle position. (This feature was developed under sponsorship of the Wright Air Development Center.)

Like the newer autopilots for fixed-wing military aircraft, the Sperry helicopter autopilot enables the human pilot to over-ride the automatic system and introduce maneuvers through the regular control stick and pedals.

Automatic hovering over a fixed spot, at constant altitude, is possible by feeding Sperry system with signals from inertial devices in the helicopter or from submerged sonar units, cables and ground radio signals. It also opens up the possibility of pilotless helicopter operation for such things as airlifting cargo to a tactical position or hoisting a radar antenna.

Sperry reports that the system remains operative (through battery power) despite engine failure, to maintain constant rotor rpm and provide stabilization until the point of flare-out.

Sperry used "redundant design" in the system's circuits, and provided duplicate amplifiers (wherever tubes or transistors are used) so that failure of one unit does not incapacitate the system.

Adm. Pearson Asks Support-Policy Review

Los Angeles—Rear Adm. John B. Pearson, Jr., USN, last week proposed a strong review of the Navy's aircraft support equipment program.

"Development of support equipment, its readiness and placement into service is of major interest," Pearson said, following formal acceptance last week of command of the Bureau of Aeronautic's Western District.

Under his broad management and technical control, will be six major Bureau of Aeronautics representatives and three resident representatives who have naval inspection cognizance over such companies as Douglas Aircraft Co., Lockheed Aircraft Corp., Convair, Goodyear Aircraft Corp., Hiller Helicopters and Aerojet-General Corp.

Pearson said the importance of a support equipment program often is overlooked and a fleet of aircraft is no better than the ability to get it in the air.

He noted that over half of the Navy's aircraft contracts are in the Southern California area.

Wilson Seeks Tighter Spending, Orders Review of Procurement

Washington—Defense Secretary Charles E. Wilson, adamant in his stand that the national defense program will not be curtailed, nevertheless last week took two steps to enforce maximum economy and efficiency in procurement.

After ordering the elimination of 68,000 civilians on the department payroll, he directed the military secretaries to tighten up on procurement and production. There was no indication that goals will be altered.

Wilson also named Deputy Defense Secretary Rueben B. Robertson, Jr., as chairman of an ad hoc committee to study ways to shorten the development time of aircraft and helicopters. The group, which will look into all phases of research, development and procurement, also includes Frank D. Newbury, Assistant Secretary for Applications Engineering; Robert D. King Deputy Assistant Army Secretary for Financial Management and James N. Davis, consultant to John Hopkins University Research Office. King will serve as management director and Davis as technical director to the committee.

Air Force spokesmen did not feel that Wilson's request for new procurement economies would have serious effect on aircraft industry contractors. Some tightening up is to be expected, but most of Wilson's suggestions, it was pointed out, duplicate USAF policies already in effect.

The Secretary laid out his program in a memorandum which he refused to call a directive. He is offering "guide lines," he said, and reluctantly set a figure of about $500 million as the amount he wants to save, bringing the department's Fiscal 1956 spending within a limit of $34 billion.

There were some rumblings among industry representatives who suspect that the Wilson "guide lines" can result in an aircraft procurement stretchout. This thought was denied by Pentagon observers, who believe that the Secretary will stick to his goals, particularly the 137-wing Air Force.

It was pointed out that there is a difference of opinion between the Army and Air Force, for example, on how long a new war would last. Army would prepare to fight two years. USAF believes the atomic age will curtail it to 30 or 60 days.

In his memorandum, Wilson said "critical examination is to be made of current plans for support forces and the accumulation of mobilization reserves to assure that they are established at minimum feasible levels, within the requirements of the Logistic Annex to the Joint Mid-Range War Plan.

"Where mobilization reserve levels presently represent substantial inventories, delivery of material on order will be delayed to the extent possible without incurring substantially increased unit costs, and the placing of unnecessary follow-on orders will be avoided."

Objectives listed by Wilson include:

- **Tighten up of flight time,** particularly in the field of proficiency and non-essential flying.
- **Restrict overhaul and modification** programs to equipment for current requirements.
- **Reduce stock levels** of spare parts.
- **Increase self-maintenance** of aircraft.
- **Salvage overage, obsolete aircraft.**
- **Hold to a minimum the utilization** of contractor-furnished maintenance personnel and field representatives.
- **Review requirements** in the light of availability of modern weapons.
- **Evaluate existing contracts,** modify reserve requirements.
- **Cancel contracts** for unnecessary material except when termination charges would be excessive.
- **Eliminate unnecessary multiple sources of supply.**
- **Reduce procurement** of development-type items.
- **Adjust buying to reduce** stocks on hand where possible.

Wilson made it clear that high-priority items in the R & D field will continue to get emphasis.

Wilson said curtailment of non-productive programs is necessary so that others "can be adequately supported within the approved level of expenditures."

TAC Gets Probe & Drogue Tankers

The U. S. Air Force is converting 100 B-50 bombers to three-point refueling tankers for the Tactical Air Command. The multi-million dollar conversion contract awarded to Hayes Aircraft Corp., is the first large USAF commitment for the probe and drogue refueling equipment manufactured by Flight Refueling Inc.

TAC has long stated a requirement for multiple point refueling for its fighter and fighter-bomber aircraft. It has been using KB-29 tankers "handed down" from the Strategic Air Command and equipped with the Boeing-developed single point flying boom system.

The KB-50s will be cleaned up aerodynamically, adding a few knots to its normal 30-40 knot speed advantage over the KB-29s. With this added speed and the equipment to fuel three F-84Fs or F-100Cs simultaneously, TAC believes the KB-50s will meet its requirements for the next three to five years.

Model A-12-B1 Flight Refueling hose reel units will be mounted at each wing tip and in the belly of the B-50s.

TAC's F-84Fs, now equipped for flying boom refueling, have a probe conversion kit with which to change the boom receptacle in the wing, just outboard from the cockpit.

Piasecki Helicopter Stockholders to Meet

Stockholders of Piasecki Helicopter Corp., will meet this week to consider a new stock option plan for company executives and the possibility of changing the corporation's name. Both questions involve mild controversy. A proposal of the directors that the company name be changed to Vertiplane Corp., to distinguish it from Piasecki Aircraft Corp., may run into legal tangles because the Ryan Aeronautical Co., of San Diego, Calif., has an application pending to register the trademark "Ryan Vertiplane." Piasecki Aircraft is a new company founded by Frank N. Piasecki after he was ousted as board chairman of the original company.

If the Vertiplane name is not available, proxies will be sought by the Piasecki Helicopter management to defeat the proposal and another title will be sought.

Another management plan, to make 67,184 shares of stock available to company executives and key employes at a bargain price, is the subject of a dispute between Frank Piasecki and Don R. Berlin, president and new board chairman of the company.

Piasecki has asked stockholders to vote against the proposal, warning that it places control of the company in jeopardy. Berlin has denied this, claiming advantages over the sale of stock on the public exchanges and holding that the total percentage is too small to assure control by the internal management.

Also at this week's meeting, action will be taken on the nomination of Thomas K. Finletter, former Air Force Secretary, and John F. Floberg, former Assistant Secretary of the Navy for Air, to the board of directors.

Eyewitness Report:

'Misadventure' Caused Midge Loss

The Folland Midge, prototype of the Gnat (AW Oct. 17, p. 34), crashed in England Sept. 26 after a "protracted" takeoff run (AW Oct. 3, p. 13). Max Mathez, member of a Swiss Army Air and Supply Department delegation which was planning to purchase six Midges, was flying the aircraft. AVIATION WEEK has received the following report from an eyewitness:

"Mathez was the twenty-first pilot to fly the Midge. He was fully briefed by Ted Tennant (Folland's chief test pilot) and after the briefing was invited to leave the cockpit and have a cup of coffee before making the flight. He refused the invitation, asked for and received permission to taxi out and later for permission to take off.

"At first the take-off was normal, and it was not until the Midge was still on the runway at a point well past that at which it should have taken off that alarm was felt by the knowledgeable among the spectators. Some eye witnesses said the Midge left the runway for a short distance, but photographs taken soon after the crash show that one wheel, at least, was on the ground when the Midge ran off the runway into the grass over-shoot area, and that all three were bearing hard within a matter of 20 yards or so.

"The distance from the end of the runway to the line of trees flanking the airfield at this point is about 250 yards. After about 200 yards it begins to slope away quite steeply. The Midge, still on the ground, hit a ridge about a hundred yards from the trees and shot into the air in a steep nose-up attitude. A moment later it hit two fir trees and started to break up as it cartwheeled into some water meadows alongside the River Test. The tops of the two trees were knocked off about 20 ft. from their bases, but the wings of the Midge remained in position though cut through from the leading edge to the main spar on each side by the tree trunks—cuts indicating that the pilot must have tried to fly between the trees.

"The point of impact with the trees was found to be 14 ft. below the level of the end of the runway. No change in the engine note occurred until the Midge hit the trees, and the aeroplane must have been going very fast indeed when it ran into the over-shoot area. No one was really in a position to see whether the Midge was actually gaining height when it hit the trees, but if it had been only 20 ft. higher it would have missed them.

"At the inquest, held two days later, the coroner said that there was strong evidence that the Midge was entirely serviceable when Mathez climbed into it and in returning a verdict of 'death by misadventure' implied that the accident was most probably attributable to the 'human factor.'

"Giving evidence, Ted Tennant said that he had briefed the pilot as fully as possible and had been most careful to stress the importance of having a correct tailplane setting for take-off. He had, in fact, set the tailplane correctly before Mathez taxied out for the take-off. A member of the Swiss mission, of which Mathez formed part, gave evidence that he was present when Tennant briefed the pilot and had, in fact, translated some of Tennant's remarks to make sure that the pilot understood them. This witness was satisfied that 'Mathez had been adequately instructed in the Midge's flying technique.'"

Douglas Indorses USAF Policy To Penalize Performance Failure

Santa Monica, Calif.—Douglas Aircraft Co. has announced its approval of the new Air Force get-tough policy calling for financial penalties against firms failing to meet performance guarantees.

The airframe company believes, however, that the policy should be applied on a long-term basis rather than on specific contracts.

This statement by Donald Douglas Jr., vice president, was made at the first national meeting of the Military Products Division of the Radio-Electronics-Television Manufacturers Assn. (RETMA).

Douglas pointed out that too-severe application of the get-tough policy might discourage companies from taking large steps forward in attempts to advance the state of the art. He added:

"So that manufacturers will be willing to take a reasonable chance and keep moving forward, I believe that a company's performance should be measured on a long-term basis rather than on a specific contract."

Douglas said his company favors the principle because it will result in more realistic design competitions.

"I am assuming that it will be limited to production items," he said. "The same policy applied to research and development would kill interest in this type of work."

Citing possible pitfalls, he said:

"Suppose, for instance, that one of you guaranteed a 90% kill probability on a fire-control system and had your profits cut in half because you could only deliver an 80% probability. Next time you probably would take no chances and would only guarantee 80%."

How Big a Step?

He said this is the biggest problem in national defense today. "How big a step forward should we take in the state of the art at a given time? We can get into trouble either way, by going too far or by not going far enough."

The Douglas statement came shortly after Maj. Gen. T. P. Gerrity, USAF Director of Procurement and Production Engineering, said the Air Force will eliminate development programs which fail to offer large gains in performance (AW Oct. 17, p. 12).

• Douglas said the new Air Force get-tough policy is one of the reasons why some avionic companies, along with other component suppliers, are going to have to change their attitudes considerably. They can no longer expect merely to skim off the cream.

Douglas emphasized the importance of reliability, weight-saving and adequate cooling of avionic equipment, pointing out that these factors help in making a sale as well as price and meeting of specifications.

Equipment Evaluation

Stressing the importance of "plus values" in equipment, the air-frame official cited this memorandum from the Douglas equipment group to the chief engineer. It concerns the electric generating system for the DC-8:

"In evaluating the proposals, equipment group engineers took into account the electrical and mechanical features of the generator, regulator, protective panel, control apparatus and connecting circuits. These were evaluated not only for compliance with the specification but for any additional features or 'plus values.' Simplicity and serviceability were taken into account. The installed weight of the equipment, including wiring, was determined and included in the evaluation Other factors evaluated to the best of our ability were the engineering groups involved, the service facilities and personnel which would be available, the experience of the companies with comparable equipment and installations and the development status of the equipment being proposed."

Douglas warned that the "plus values" mentioned are going to be increasingly important in both the military and commercial field because they help to guarantee performance.

ARDC Reorganizes, Tells More Secrets

By Claude Witze

Baltimore—Air Research and Development Command has streamlined its headquarters organization and is prepared to ease the secret classification on System Requirements in another double-barreled Air Force effort to spur aircraft industry development of improved weapon systems.

Like the program to lift restrictions on Technical Program Planning Documents (AW Oct. 17, p. 12), details on System Requirements will be handed out on a restricted basis. They will be given to a few contractors in across-the-table agreements designed to take full advantage of the aircraft industry's top engineering talent and development facilities.

Indications are that the companies entrusted with ARDC's System Requirements, which involve highly secret details of USAF's war planning, inventory and technical data, will be major weapon system contractors. The list will be as selective and not much larger than the Air Materiel Command's list of potential contractors for a given weapon system and as a general rule will include the same names. AMC, on abolition of paper design studies this summer (AW Aug. 8, p. 12), said it would further conserve on industry's engineering effort by restricting Phase I competitions to contractors with proven ability.

Boyd in Key Post

Most significant of ARDC's organizational changes is the establishment of a Deputy Commander for Weapon Systems, a post initially filled by Maj. Gen. Albert Boyd, former commander of Wright Air Development Center. Other deputy commanders under the new setup are:

- **Brig. Gen. Kurt M. Landon,** Deputy Commander for Resources.
- **Maj. Gen. Floyd B. Wood,** Deputy Commander for Research & Development.

Creation of General Boyd's new job follows realization by Lt. Gen. Thomas S. Power, ARDC Commander, that proper management control over weapon systems can be realized only by the consolidation of planning and policy-making functions at headquarters of the command.

The entire program is part of Gen. Powers' plans to meet the challenge of fast-moving Russian development with "big jumps." USAF itself lacks the facilities and talent to do the job and is determined to force industry to create more of both and use them at peak efficiency. Performance in this area now clearly is the basis for competition.

Seek New Concepts

Great stress is placed within ARDC on the reorganization in the office of the Deputy Commander for Research & Development, designed to put emphasis "on the development of new concepts and equipment which can be introduced into new air weapons."

Separation from this office of weapon systems, placing them under a separate command headed by Gen. Boyd, is an important step in this direction. It places ARDC control of systems at a command level near the top, apart from all the other R & D problems encountered in the day-to-day operation of Baltimore headquarters.

"One of the big problems," a top programming officer told AVIATION WEEK, "is the fact that deadlines have to be met during the growth of a weapon system, and the essential decisions were only part of the work that had to be done under the old Technical Operations Office. Now we have a setup that can give its entire attention to problems coming out of the Weapon System Project Office (WSPO)."

WSPO Action Speeded

Under Gen. Boyd, there now is a Directorate of Systems Management, headed by Brig. Gen. Howell M. Estes Jr., who also serves as Assistant Deputy Commander for Weapon Systems. Under him are the ARDC components of the WSPO. These include offices for equipment and handbooks and program control as well as divisions covering bombardment aircraft, fighter aircraft, bombardment missiles, supporting systems, cargo and trainer aircraft, fighter missiles and drones and rotary wing and liaison aircraft.

For the contractor, separation of these offices from the other vast interests of ARDC's Research and Development should result in faster action on the tremendous amount of paper work that accompanies early development of a new system.

A counterpart of the Systems Management Office under General Boyd is the Directorate of Systems Plans, headed by Col. Ernest N. Ljunggren. It is from this office that ARDC's secret System Requirements will be distributed to a few highly qualified contractors.

Must Show Capability

Qualification to know the System Requirements, Col. Ljunggren said, will depend on these factors:

- **The preliminary design capability** of the contractor. This will get major emphasis because the long range aim is to keep preliminary design groups in the industry busy and coming up with new ideas. Stimulated activity, it is hoped, will result in major breakthroughs that will contribute to "big jumps."
- **The interest shown** by the contractor in a particular field of development.
- **The new ideas** already produced or suggested by the contractor.
- **The contractor's existing facilities.** This does not mean that an aircraft company will be cut in on the requirements simply because he has a facility. He must meet other qualifications as well.

As in the case of firms allowed to share the secrets of ARDC's Technical Program Planning Documents, contractors who obtain release of the System Requirements will not get a contract to pursue any particular project. They must use their own money in exploration of the field in which ARDC considers them qualified.

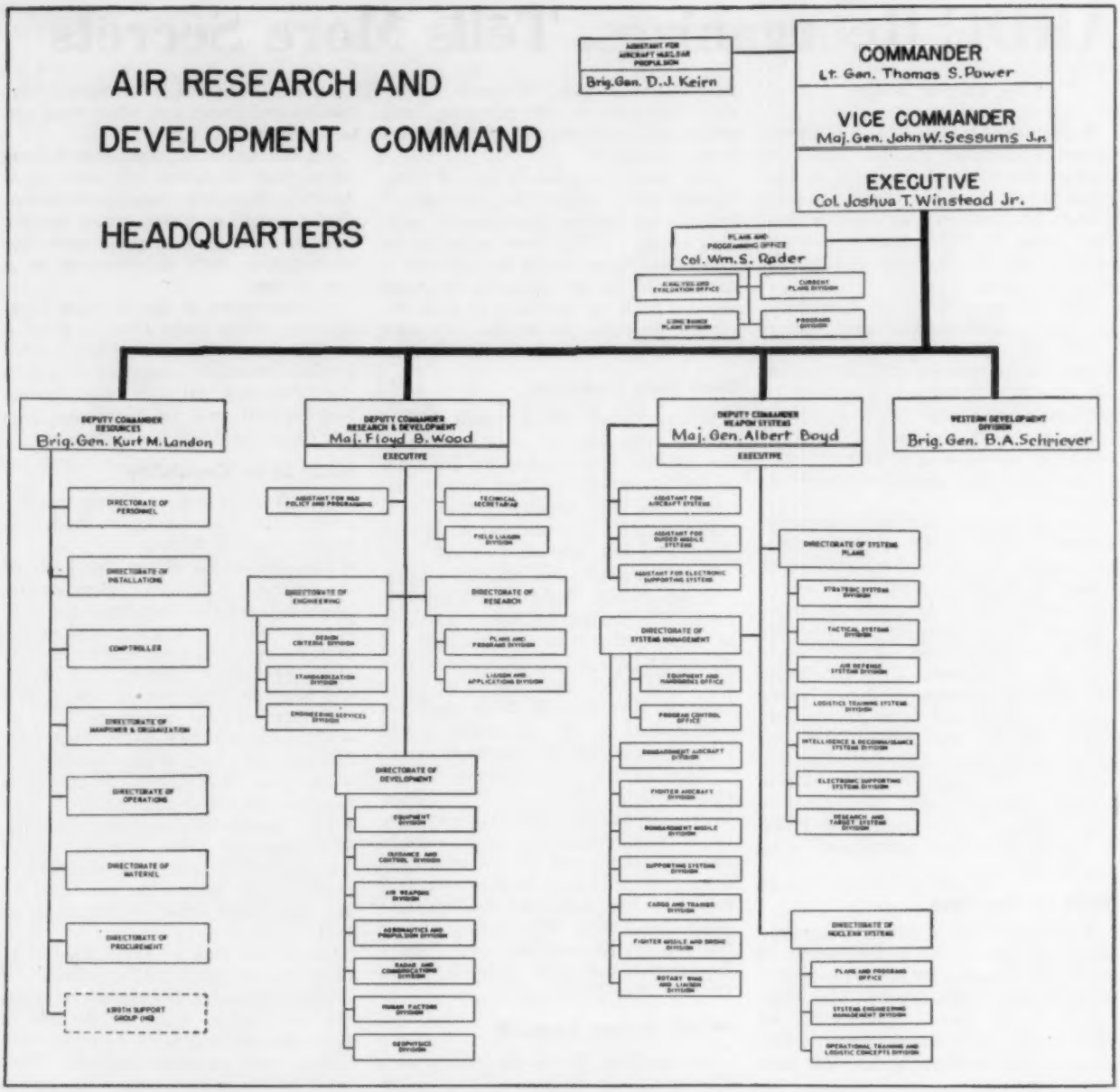
On the other hand, ARDC does expect that contractors will come up with proposals and they are encouraged to do so. From time to time the situation may arise where a void exists between the contractor's proposal and the ultimate weapon system as visualized by ARDC.

BOYD
Weapon Systems

WOOD
Research

ESTES
Systems Management

OSTRANDER
Guided Missiles



In this case, it is possible that design study funds can be spent to complete the development.

Contracts Possible

The general philosophy is that contracts may be used to fill gaps but are not expected to be necessary once industry development competition is in full swing. Sharing the secrets of the System Requirements is intended to assure that industry development work heads in the right direction, overcoming the complaint that USAF expects industry to spend money on these projects but makes programs nearly impossible by enforcing security in scientific areas.

Other facets of the program, as explained in Baltimore, are that it will provide a contractor with much of the technical information he formerly received from work on a design study and that development will be speeded because USAF will make more decisions before the industry effort is expanded.

Other New Offices

Also, in the offices under Gen. Boyd, separation of systems plans from systems management is expected to expedite work in both fields. One of the old chronic complaints was that WSPO personnel were hampered in the production of a new system by the almost continual introduction of new ideas, improvements and at times extraneous suggestions. It is intended that these matters will be handled by the Directorate of Systems Plans and not passed to the Directorate of Systems Management until they have met all tests for practicability and necessity.

Third major office under Gen. Boyd is a new Directorate of Nuclear Systems, headed by Brig. Gen. Ralph Wassel, who is posted at WADC.

In addition, there are three other top management functions. They are an Assistant for Aircraft Systems, an Assistant for Guided Missile Systems and an Assistant for Electronic Control Systems. Col. Ljunggren temporarily is filling the first post and Brig. Gen. Don R. Ostrander has been named to the missile office. The electronic assistant has not been named.

These positions were created to plan and manage the entire USAF weapon systems program in a specific area. They are intended to provide necessary emphasis in the three areas to "attain a proper balance of superior weapons for all combat missions."

Here's a New *RUGGED MOTOR*

for *RUGGED* applications

Can you make use of it?

EEMCO

technical bulletin

SPECIFICATIONS—
TYPE D-812 HOIST MOTOR

Capacity: 2.7 HP at 3000 RPM on 26½-volt DC.
Duty Cycle: 20 minutes "on" and 1 hour "off".
Weight: 21 pounds.
Military Specification: Meets MIL-M-8609.
Special Features: Explosion- and splash-proof.

Type D-812 is a rugged hoist motor specially designed by EEMCO for use in aircraft. Like many EEMCO motors and actuators, Type D-812 may be adapted to other applications with or without slight modifications. Weighing 21 lbs., on 26½-volts DC, it delivers 2.7 HP at 3000 RPM at the output shaft. It has a duty cycle of 20 minutes "on" and 1 hour "off". D-812 is explosion- and splash-proof, and like all other EEMCO motors, has been designed to meet Military Specification MIL-M-8609.

EEMCO SPECIALIZES IN MOTORS AND ACTUATORS

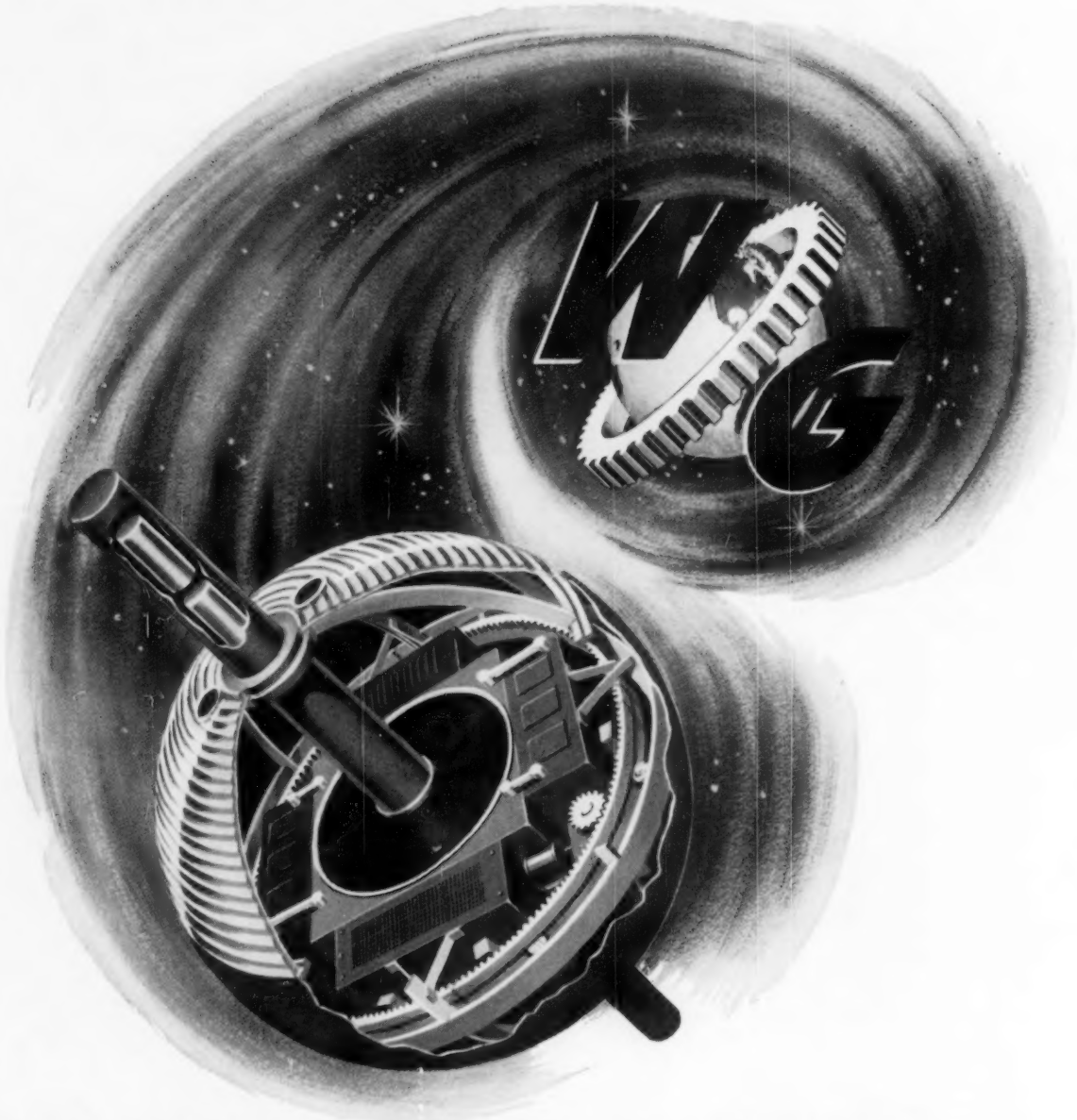
EEMCO's facilities and capabilities are devoted exclusively to the design and manufacture of special motors and rotary and linear actuators. Since 1942, EEMCO has made nothing else. Therefore, your motor and actuator needs can best be filled by EEMCO specialists whose talents are confined to producing these essential items. And . . . on-time deliveries are routine at EEMCO.

PROJECT ENGINEERS: You can save valuable time and development expense by adapting a proven EEMCO motor or actuator to your needs. Your inquiry is invited.

Electrical Engineering and Manufacturing Corp.

4612 West Jefferson Boulevard
Los Angeles 16, California
Telephone REpublic 3-0151

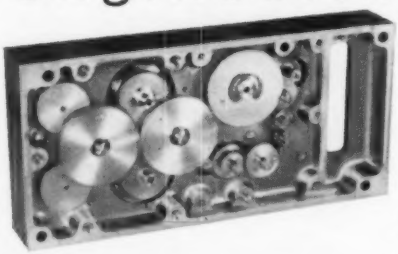
Designers and producers of motors, linear and rotary actuators exclusively



Out of this world engineering...

History's first man-made satellite is scheduled for flight by mid-1957. Much of its success will depend upon almost unbelievably accurate mechanical power transmission equipment, such as the intricate mechanism shown here which WESTERN GEAR designed and manufactured for classified missile and rocket application.

If yours is a problem requiring utmost precision in the transmission of motion or torque through mechanical means, WESTERN GEAR is confident of its ability to solve it. Sixty-seven years of experience is available without obligation. Address General Offices, WESTERN GEAR, P. O. Box 182, Lynwood, California.



Satellite drawing courtesy Popular Science Monthly

"The difference is reliability" ★ Since 1888

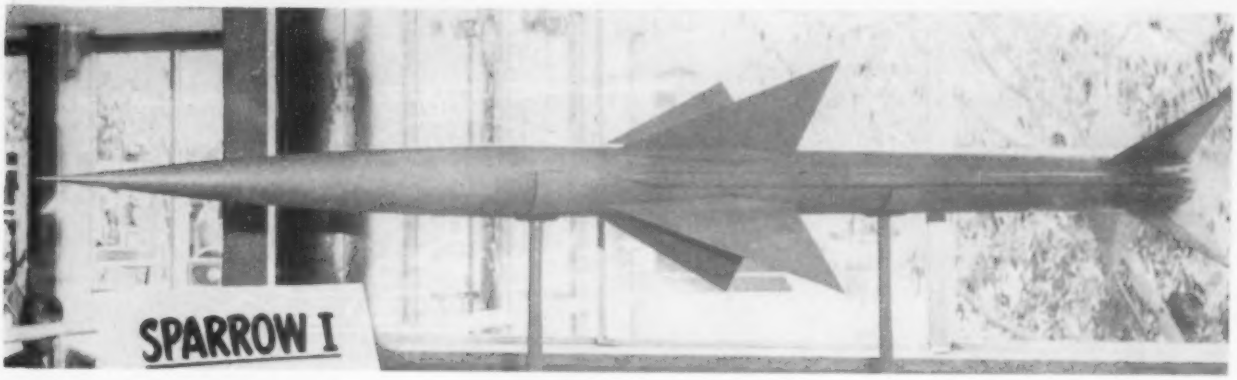
5587

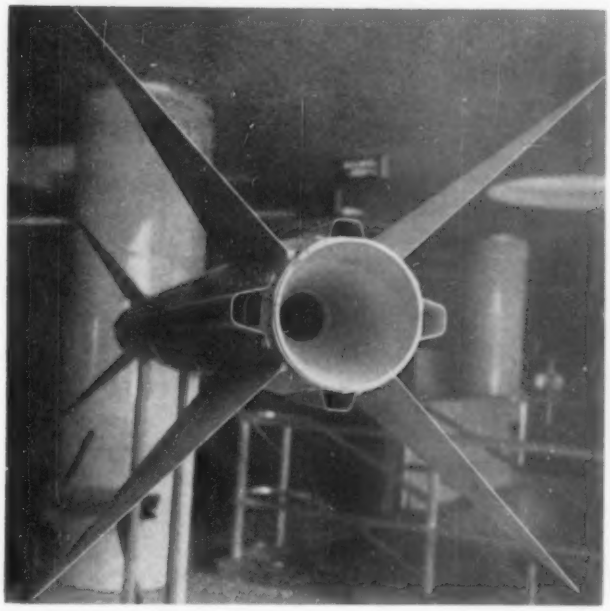
WESTERN GEAR *Corporation*

ENGINEERS AND MANUFACTURERS

Plants at Lynwood, Pasadena, Belmont, San Francisco (Calif.), Seattle and Houston. Representatives in principal cities

Navy Sparrow in First Detailed Pictures





Aerodynamic and structural layout of the Sperry Sparrow I is shown in these first detailed pictures of the Navy's latest air-to-air missile.

Wings and tail are delta planform, double-wedge airfoil sections. Sweep is greater for wings than for tail.

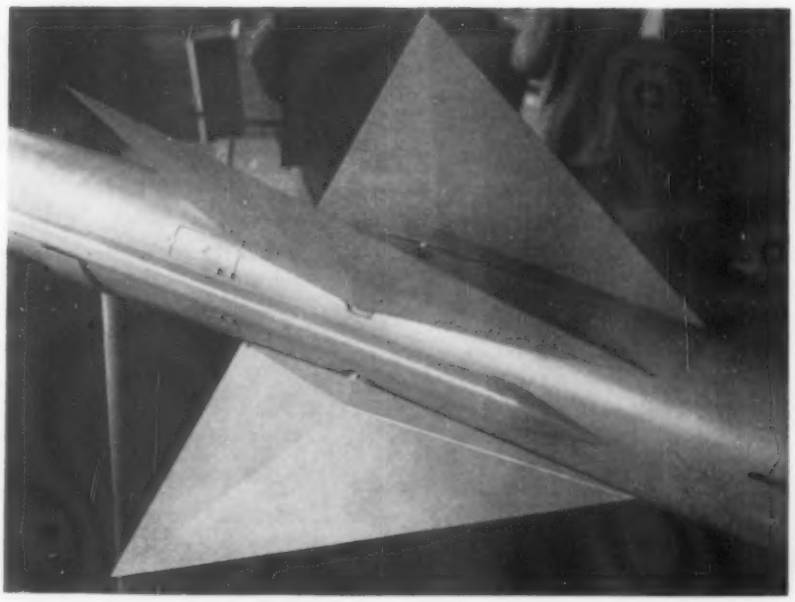
Wings are movable, tail fins fixed for high degree of maneuverability. Wings are pivoted at the root.

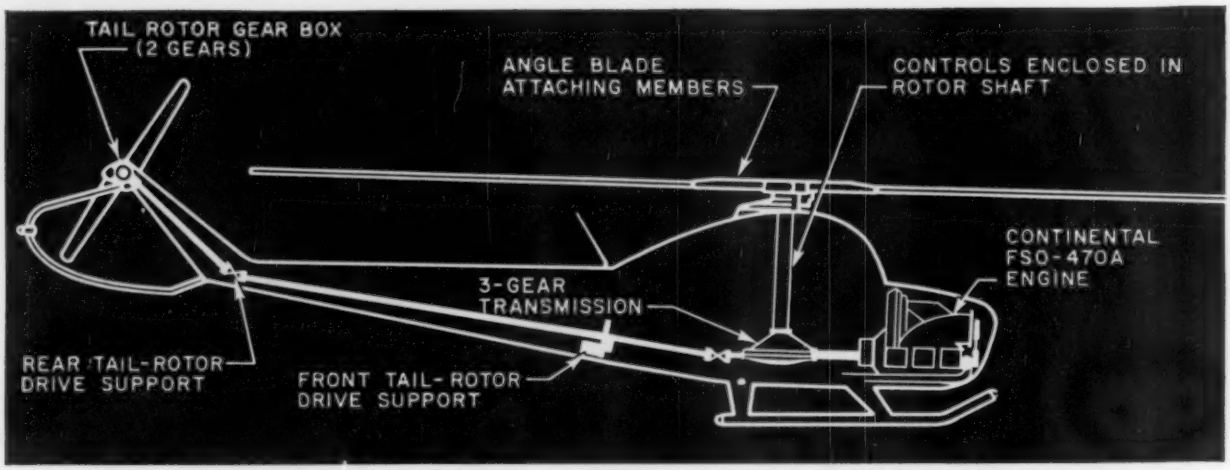
Tail fins fit in slots cut into the trailing edge of the cast exhaust cone.

Sparrow I has a solid-propellant rocket to drive it at speeds approaching Mach 3 at burnout. Range is about five miles.

Launched from underwing racks, Sparrow requires no booster. Guidance is beam-rider system, directed from the launching aircraft.

Current Sparrow I, designated AAM-N-2, is being built by Douglas Aircraft under Sperry subcontract. Advanced versions of Sparrow—models 2 and 3—are in development and test stages.





From Cessna . . . A New Concept in Helicopters.

Cessna CH-1...designed for less maintenance!

Cessna's rugged, all-metal CH-1 brings outstanding performance to helicopter flying. The new helicopter can climb from sea level to 10,000 ft. in less than 10 minutes. It can hover easily at 15,000 ft., has speed of over 120 m.p.h.!

The simplified mechanical detail of the CH-1's revolutionary transmission, rotor assembly and drive system eliminates many extra parts requiring lubrication and service, cuts down on maintenance costs.

The CH-1's engine location—in the nose of the fuselage—is an example of the new helicopter's functional design. Mounting the engine forward means important savings in installation and servicing time, provides extra cargo, or passenger, space.

Development of the CH-1 climaxes three years of intensive research by Cessna designers and engineers. The new helicopter fills a definite need, is a noteworthy contribution to aviation.

CESSNA AIRCRAFT COMPANY

Cessna®

WICHITA, KANSAS

Josh Lee Protests Short-Haul Mail Rates

Final mail rates set for local service airlines by the Civil Aeronautics Board have drawn a minority protest from CAB member Josh Lee.

The new rates establish the multi-element formula principle for the local airlines with standard pay for line hauls and terminal handling.

Lee says the new formula doesn't offer a reasonable price for air mail service. He favors establishment of a minimum station charge for low traffic points.

Under the new rate, which became effective Oct. 1, the local airlines will get a line-haul rate of 30.17 cents a ton-mile and a terminal rate ranging from 3.32 cents to 33.21 cents per pound according to the traffic generated at the station (AW Sept. 26, p. 107).

The new scale, similar to one now applied to the trunk carriers, will pay the local carriers about $883,000 a year. Separate rates are set for individual lines for the period July 1 to Sept. 30, 1955.

Lee filed a separate statement with the rate order in which he maintained that the multi-element rate formula doesn't pay carriers enough when applied to small volumes of mail at stations which don't produce an appreciable amount of traffic.

Lee favors a minimum terminal charge of $15 a day. In support of his argument, he quotes a study of terminal costs made by the CAB Office of Carrier Accounts and Statistics which found that the minimum station cost per day which can be assigned to mail service is $10. Lee would set the charge at $15 to cover such factors as general administrative costs and return on investment not covered by the study.

If the minimum station charge were applied, Lee would reduce the line haul rate to 29 cents a ton-mile. These alterations of the rate structure would pay the local carriers about $2,210,000 a year.

Airborne Surface Mail

Approximately 6% of the total first class surface mail volume is now moving by air, just two years after the Post Office Department inaugurated its experiment of airlifting surface mail on a space available basis, according to an official report.

Applauding the success of the experiment, Postmaster General Arthur Summerfield said that "nearly a billion letters a year are being delivered sooner, as much as 48 hours in many instances." The airlift operation has been expanded to provide direct service to 200 cities in 33 states.

SPECIAL AIRCRAFT PUMPS

Eastern Aircraft Pumps are extremely small in size and light in weight. They are built to meet all appropriate government requirements under exacting conditions.
Six series of Eastern pumps described are representative models from the entire range of Eastern units, and provide a wide choice of performance characteristics.
Special model pumps or completely new units can be custom-made to your project.

THE 1700 SERIES is the *smallest* and *lightest* line of pumps ever made for delivering a small, yet accurate, volume of fluid against high pressures while operating at high speeds. When close-coupled to high speed motors, the size of the motor and pump combination remains small and light in weight. They are designed to meet rigid military specifications governing aircraft installations. Listed are a few of the many special pumps tailored to meet special requirements.

THE 1200 SERIES was designed to meet the requirements for greater flow than the 1700 Series. The displacement of the smallest pump in this series is 0.0154 cubic inches per revolution. The largest pump has a displacement of 0.0768 cubic inches per revolution. This series operates satisfactorily between a temperature range of —65°F to +160°F. They handle pressures as high as 1,000 p.s.i. and can be driven at speeds up to 6,000 R.P.M.

THE 1100 SERIES has similar performance characteristics to the 1700 Series. The displacement of the smallest pump in this series is 0.00838 cubic inches per revolution.
1101-5 is flange-mounted pump. *1102-10B* is specially constructed of corrosion resistant materials; bronze housing, bronze gears, monel shafts, carbon bushings and synthetic rubber seals—designed to handle degreasing liquid.

THE 1400 SERIES Pumps are multi-element units of minimum weight and size designed to perform satisfactorily under severe conditions of low temperature and high altitude. These pumps have an aluminum housing, steel gears and shafts, synthetic rubber seals, and carbon bearings. The multi-element pumps are designed to meet requirements for scavenging and lubricating.

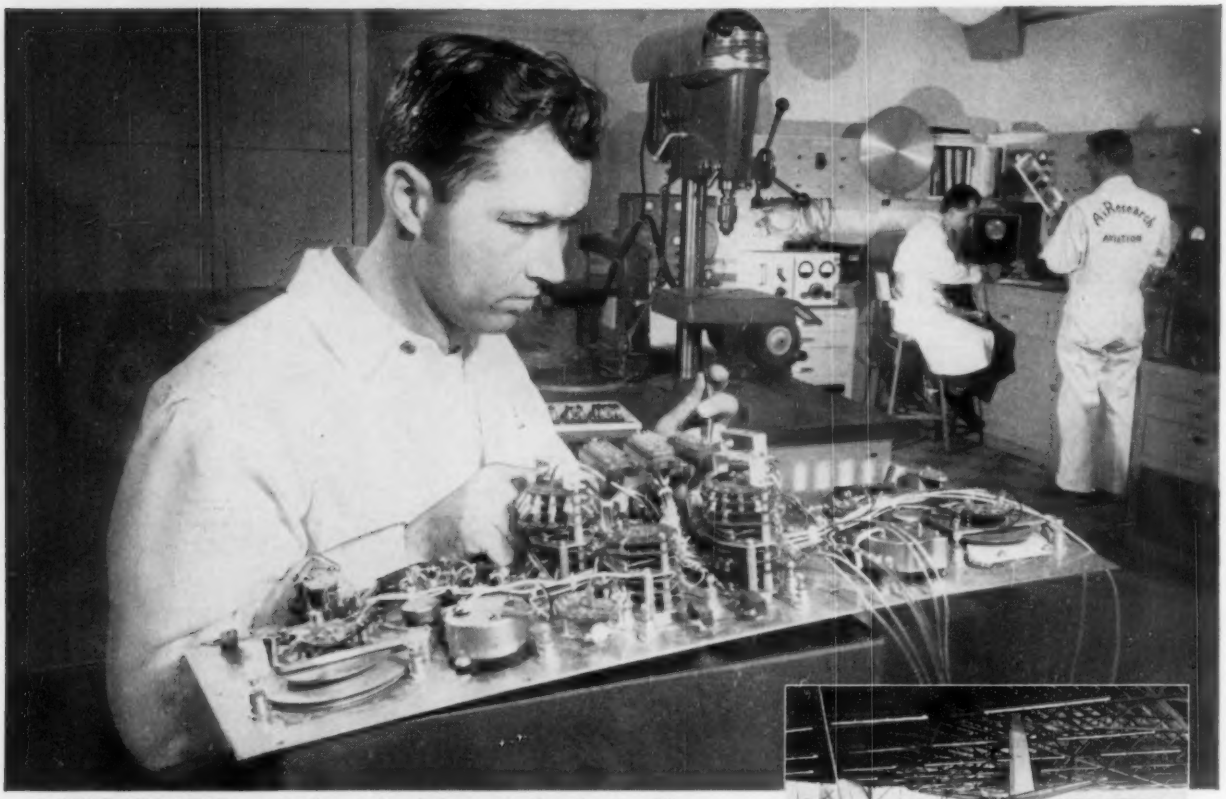
THE AR SERIES are commonly used as emergency stand-by fuel pumps. Motors are 1/50 H.P. aircraft type, 4500 R.P.M., available for 12 or 24 volt D.C. Size 6" x 4-3/16" x 2-3/16". Weight is approximately 2-1/4 lbs. Pumps are constructed of aluminum, and have mechanical rotary seals.

THE 100 SERIES is a continuation of the 1200 Series for still greater flow requirements. The displacement of the smallest pump in this series is 0.104 cubic inches per revolution. The largest pump in this series has a displacement of 0.365 cubic inches per revolution. Operates between a temperature range of —65°F. to +160°F. and pressures up to 1800 p.s.i.g.; speeds up to 3450 R.P.M.

Eastern INDUSTRIES, INC.
100 SKIFF STREET
HAMDEN 14, CONN.

Write for Aviation Products Bulletin 330.

Now! Finest radio and electronics service center for business aircraft!



VISIT OUR SHOPS at the International Airport in Los Angeles. Meet our unsurpassed staff of electronics engineers and FCC technicians, all thoroughly experienced in aeronautical communications. Examine the finest equipment and test facilities in the country.

No expense has been spared at the new AiResearch Aviation Service electronics center to provide business aircraft with the kind of complete service facilities previously only available to the airlines.

This department is completely set up to handle radio sales, engineering, design and installation, as well as the service and repair of aeronautical communications and navigational equipment. We are CAA certified for Class I and Class II.

A complete line of electronic equipment and parts is stocked for immediate delivery. Brands include COLLINS – BENDIX – WILCOX – RCA – SPERRY – ARC.

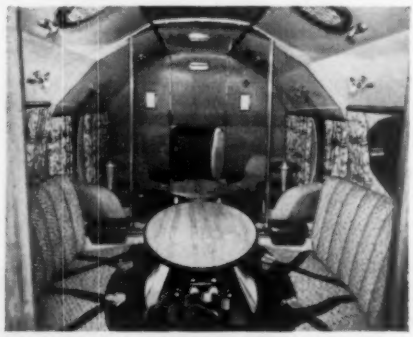
SPECIALISTS IN AIRCRAFT SERVICE AND CONVERSION

THE GARRETT CORPORATION

AiResearch Aviation Service Division

Los Angeles International Airport, Los Angeles 45, California

SERVICE FACILITIES. AiResearch offers the most complete facilities in the country in all phases of aircraft service. This includes rapid and efficient turn-around service.



REBUILDING AND MODIFICATION. Complete engineering modernization service, outstanding interior styling and fine craftsmanship combine to give your airplane high performance and luxurious comfort. Some satisfied customers are National Cash Register, Thompson Products, Humble Oil, Chicago Tribune and Goodyear.

UAC-Rensselaer Combine Talent; Evolve New Concept in Education

By Jerome E. Kelley

South Windsor, Conn.—An unusual experiment in engineering education is being conducted in this quiet Connecticut community at Rensselaer Polytechnic Institute's Hartford Graduate Center.

The center is a cooperative venture between United Aircraft Corp. in East Hartford, Conn., and Rensselaer Polytechnic Institute in Troy, N. Y. (AW June 13, p. 40).

Filled to capacity by 220 students, most of them engineers employed by UAC, the new center has broken several precedents in education.

It is a joint venture of educators and industrialists pioneering in the educational field in an effort to do something about the nation's shortage of scientific and engineering talent.

Behind the thriving new center was the fact that UAC had become increasingly disturbed at seeing its scientists and engineers leave its laboratories and assembly lines to seek graduate degrees in their chosen field at distant universities. With the problem a growing one, UAC moved to solve it.

Within six weeks, UAC and RPI, the nation's oldest engineering college, had set up a plan for graduate education in the greater Hartford area. This fall, five months from the time of the plan's inception, the center went into operation with a 23-member faculty.

UAC has furnished a 22,000-sq. ft. building in South Windsor as an outright gift to RPI. It is the former site of UAC's nuclear powerplant laboratory. The building, entirely renovated, contains 10 classrooms, two seminar rooms, a lecture hall, library, study room, cafeteria and 14 offices.

United's Program

All qualified employes of UAC will be admitted to the new center, and the company will underwrite the full cost of tuition. At the present time, all but two of the students are employes

Hinged Cowl Simplifies XHR2S-1 Engine Inspection

Easy accessibility to P&W R2800-50 engines on Sikorsky XHR2S-1 Marine helicopter is shown by this photo of engine cowl hinging downward, exposing most of the powerplant.

Now

YOU CAN GET MORE TOOLING FOR YOUR DOLLAR

WHATEVER *product you manufacture, Rezolin Toolplastik will aid you in reducing your production costs by providing you with a simple and effective method of tooling.*
Rezolin Toolplastik materials will reduce tool fabrication time and the cost of your present tooling material.
Ideally suited for producing draw dies, drop hammer dies, stretch dies, chucks, assembly fixtures and jigs, models, etc.

INTERCHANGEABLE PLASTIC DRAW DIES
Produced and trimmed over 15,000 auto hub caps saving 40% of former tool costs.
Courtesy of Shore Metal Products, Los Angeles

Rezolin Toolplastik material offers more cubic inches of precision tooling per dollar than any other material in the field.
When a tooling need arises consider Toolplastik.

Write for your free informative Brochure and Handy Use Guide.

REZOLIN TOOLPLASTIK

5736 WEST 96TH STREET
LOS ANGELES 45, CALIFORNIA

DALLAS • DETROIT • NEW YORK

EPOXY RESINS • PHENOLICS • DYFORM
ACCESSORY PRODUCTS

THIS IS FOR YOU ... IF YOU HAVE AN AC GENERATOR COOLING PROBLEM!

SPECIFICATIONS

208/120 Volts, 0.75 Power Factor, Y-connected, 400 CPS

Type No.	Rating KVA	Rated Cooling Air Pressure "H_2O	Rated Cooling Air lb./min.	Diam. in.	Speed RPM	Approx. Weight lbs.	Flange and Drive Spline
*28E16-1	20	6	11	8.25	6000	60	AND10266 XVI-A
*28E17-1	30	5	13	8.25	6000	69	AND10266 XVI-A
*28E14-1	40	5	14.5	9.25	6000	83	AND10266 XVI-A
*28E15-1	60	6	16	9.25	6000	100	AND10266 XVI-A
28E19-1	10	6	8.4	6.5	8000	31	AND10262 XII-A
28E19-3	10	6	8.4	6.5	8000	32	New 9" Flange
28E20-1	20	6	8.5	6.5	8000	45	AND10262 XII-A
28E20-3	20	6	8.5	6.5	8000	46	New 9" Flange
28E21-1	30	10	12.4	6.5	8000	60	AND10262 XII-A
28E21-3	30	10	12.4	6.5	8000	61	New 9" Flange
**28E10-1	9	6	8.6	6.5	8000	39.5	AND10262 XII-A

*These generators include integral fan permitting full load continuously up to 80°C at sea level with no additional cooling.

**This generator incorporates a DC output of 30 volts, 50 amps capacity in addition to the AC output.

All generators have been designed to MIL-G-6099 and MS-33542 which specifies cooling air of 120°C at sea level, 40°C at 50,000 ft., and —12°C at 65,000 ft., and will deliver full rated load under these conditions.

ECLIPSE Bendix Red Bank

HIGH-TEMPERATURE AC GENERATORS

meet military class C air-cooled specifications ... offer maximum performance at minimum size and weight... range from 9 KVA to 60 KVA

These generators are designed as part of complete Red Bank high temperature AC generating systems that also include magnetic amplifier voltage regulators and system protection components. For full details, write Red Bank Division, Bendix Aviation Corporation, Eatontown, New Jersey.

Red Bank DIVISION — Bendix AVIATION CORPORATION

West Coast Sales and Service: 117 E. Providencia Ave., Burbank, Calif.
Canadian Distributor: Aviation Electric Ltd., P.O. Box 6102, Montreal, P.Q.
Export Sales: Bendix International Division, 205 E. 42nd St., New York 17, N. Y.

of UAC, but several other companies in the area have shown great interest in the program and may soon join the venture.

The cost of a full course towards a master's degree—two to two and a half years—will be approximately $2,000. Classes are scheduled for Monday, Tuesday, Wednesday and Thursday nights, but students are encouraged not to attend classes more than two nights a week or carry a workload of more than six credit hours per semester.

In the UAC program, whenever classes conflict with working hours the company gives time off with full pay to attend classes. At present, Master of Science degrees are given with majors in the following:

- **Aeronautical engineering.**
- **Mechanical engineering.**
- **Mathematics.**
- **Applied mechanics.**

Minors are offered in several subjects, including nuclear chemistry, physics, engineering law and management engineering. It is expected that the list will be expanded into major fields of study in the near future and that, as part of the expanding program, doctoral degrees will be instituted.

Solves Many Problems

The center is helping to cope with many joint problems that have beset—and are besetting— industry and educational institutions. Among them:

- **Improvement of the ratio** between graduate degrees and bachelor degrees—a problem that has been concerning educational institutions. Most educators feel that, once a man has an engineering degree, he is anxious to enter a profession immediately but, with today's rapidly advancing technology, an increased ratio of advanced degrees is desirable.
- **Engineers can continue work** on critical defense programs while advancing their education.
- **Local industries** will be able to avail themselves of more research talent, since faculty members will be able to do independent research and serve as industrial consultants.
- **The center will provide** a healthy intellectual atmosphere in areas where it has been lacking.

Entrance Requirements

Entrance requirements for the Hartford Graduate Center are exactly the same as at the Rensselaer Polytechnic Institute campus in Troy. A recent graduate with a bachelor's degree is admitted on the strength of a transcript of his marks and recommendation of at least three of his former professors. Prospective students who have been out of college longer are given the Graduate Record Examination.

According to Dr. Clayton O. Dohren-

Combines For the First Time

Pantobase

(All Bases)

and

BLC

(Boundary Layer Control)

It is with pride that Stroukoff Aircraft is producing for the United States Air Force the most efficient advanced assault air transport in the history of military aviation.

This development combines slow landing speeds through means of the Boundary Layer Control system, and includes the Pantobase installation, both designed by Stroukoff Aircraft Corporation.

The MS-8-1 is able to land and take-off from unprepared surfaces such as rough terrain, sand, snow, ice, ordinary runways and to operate from water as well. It will do so at low speeds never before possible with aircraft of its weight; and in half the area needed by its prototypes.

STROUKOFF AVITRUC

Stroukoff Aircraft Corporation

WEST TRENTON NEW JERSEY

QUALITY SUBASSEMBLIES FAST...

See Whirlpool-Seeger for Economical, Precision Airframe Production

Whatever the job . . . large or small . . . the La Porte Aircraft Division of Whirlpool-Seeger Corporation gives you *quality production* to meet your schedule. At your disposal are complete modern manufacturing facilities . . . with over 263,000 sq. ft. of floor space . . . devoted to airframe fabrication. It's a plant with a record of turning out *top quality* at *low cost* fast . . . including such items as B-47 ailerons.

Learn how your needs . . . in any volume . . . on even the tightest schedule . . . can be filled by Whirlpool-Seeger. Write, wire or phone today for complete details.

FACILITIES TO MEET EVERY NEED...

TOOLING

METAL FORMING

METAL FABRICATION

HEAT TREATING

ANODIZING

MACHINING

FINISHING

ASSEMBLING

DEVELOPMENT AND DESIGN ENGINEERING

RESIDENT AIR FORCE INSPECTION

Send for Illustrated, Descriptive Brochure

Our sales representatives are available to consult with you any time at your convenience.

La Porte Aircraft Division

WHIRLPOOL-SEEGER CORPORATION

DEPT. A, LA PORTE, INDIANA

wend, director of RPI's graduate division and one of the Hartford Graduate Center's originators, results of the tests on NAC personnel were amazing. He said:

"People taking the tests had been out of school for as long as 30 years and yet the results of the tests amazed us. They were far better than the national average."

H. M. Horner, president of UAC, had this to say about the new center:

"This program should not be confused with the usual company on-the-job training program. Modern technology is moving so rapidly, particularly in the multitude of sciences supporting aviation, that we must offer our working engineers an opportunity to broaden their background in the basic sciences. The new Hartford school will provide successful candidates with an advanced Master's or Ph.D. degree equivalent to any that can be earned at the very finest university graduate schools. If the working engineer at Hartford goes away to graduate school, we lose him for at least one to three years. We decided that it was best to bring a graduate center here to meet this continuing problem."

Dr. Warren C. Stoker, former head of the computer laboratory at RPI, is the director of the new graduate center. He told AVIATION WEEK:

"The reception of this new venture has been amazing. We have met with much enthusiasm in Hartford, and the cooperation and interest shown us by United Aircraft has been magnificent. We of the faculty fully realize that this is a new venture in technological education, but we sincerely believe that as time goes on many more forward-looking American corporations and universities will institute similar cooperative educational programs."

KLM-Air Ceylon Agree

KLM Royal Dutch Airlines will own 49% of Air Ceylon and the latter's present agreement with Australian National Airways will end under a new arrangement expected to be concluded early next month in Amsterdam. Air Ceylon expects to charter a Constellation from KLM to establish Colombo-Amsterdam service and after its establishment, plans to buy new equipment.

Viscount Prices Rise

Central African Airways announced that Vickers Viscount price increases have raised the cost of its five transports on order by approximately $160,000. Spares, the company said, would cost $45,000 above original estimates. The carrier also said it has experienced a six-month delay in delivery.

FLY WEATHER-WISE

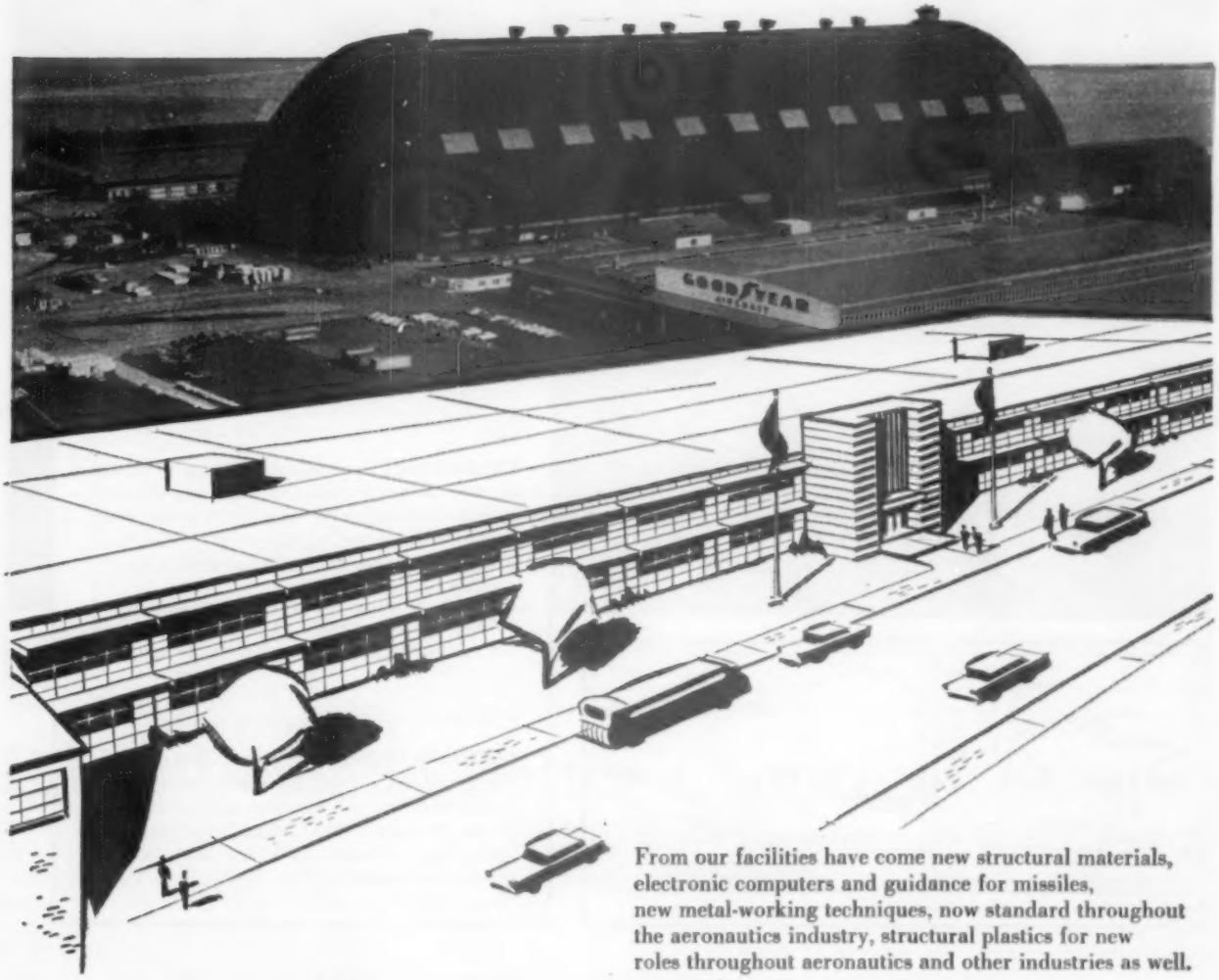
We're building another modern home

for progressive pioneering!

THE cornerstone has been laid for this new $3,000,000 engineering and research building which will soon add to the expanding facilities of Goodyear Aircraft Corporation's huge Akron plant.

Its keystone will be pioneering—continuing an aggressive policy of "curiosity" which has made Goodyear Aircraft the birthplace of many advancements which have done much to help "Keep America First In The Air."

At our multimillion-dollar Arizona plant another research and development building is being erected as an investment in an air-ready America.



From our facilities have come new structural materials, electronic computers and guidance for missiles, new metal-working techniques, now standard throughout the aeronautics industry, structural plastics for new roles throughout aeronautics and other industries as well.

Actually, it boils down to this:

As a versatile teammate to this nation's aeronautics and defense industries—Goodyear Aircraft chooses to fulfill this trust with facilities which take every advantage of its abilities.

Our skills get the full backing of our resources; our customers get the benefits.

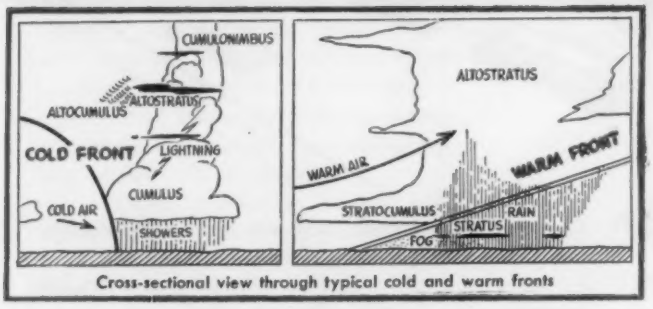
GOODYEAR AIRCRAFT

☆ THE TEAM TO TEAM WITH in AERONAUTICS ☆

AERONAUTICAL ENGINEERING

FLY WEATHER-WISE

These weather items prepared in consultation with the United States Weather Bureau



Cross-sectional view through typical cold and warm fronts

FRONTS may extend for hundreds of miles and cannot be avoided by local course changes, nor can they be topped at altitudes attainable by many planes. By understanding the principal features of FRONTS, however, it is possible to recognize them and make adjustments to the flight plan accordingly.

Here are the frontal characteristics:

COLD FRONTS—the advancing edge of a cold air mass: Showery type of rain or snow, thunderstorms—Cumulus-type clouds—Sudden wind shift after the storm, usually to W, NW or N—Drop in temperature after wind shift. Clearing weather, sometimes slow.

WARM FRONT—retreating edge of a cold air mass overrun by warm air: Steady precipitation—not showery—Stratified cloud layers—Gradual wind shift to S, SW or W—Rise in temperature and humidity—Temporary clearing.

OCCLUDED FRONT—The upper front resulting from collision of cold front and warm front: Best recognized on weather chart, but when events indicate a mixture of cold front and warm front characteristics, it's likely an occlusion has taken place.

Best Pair to Get You There!

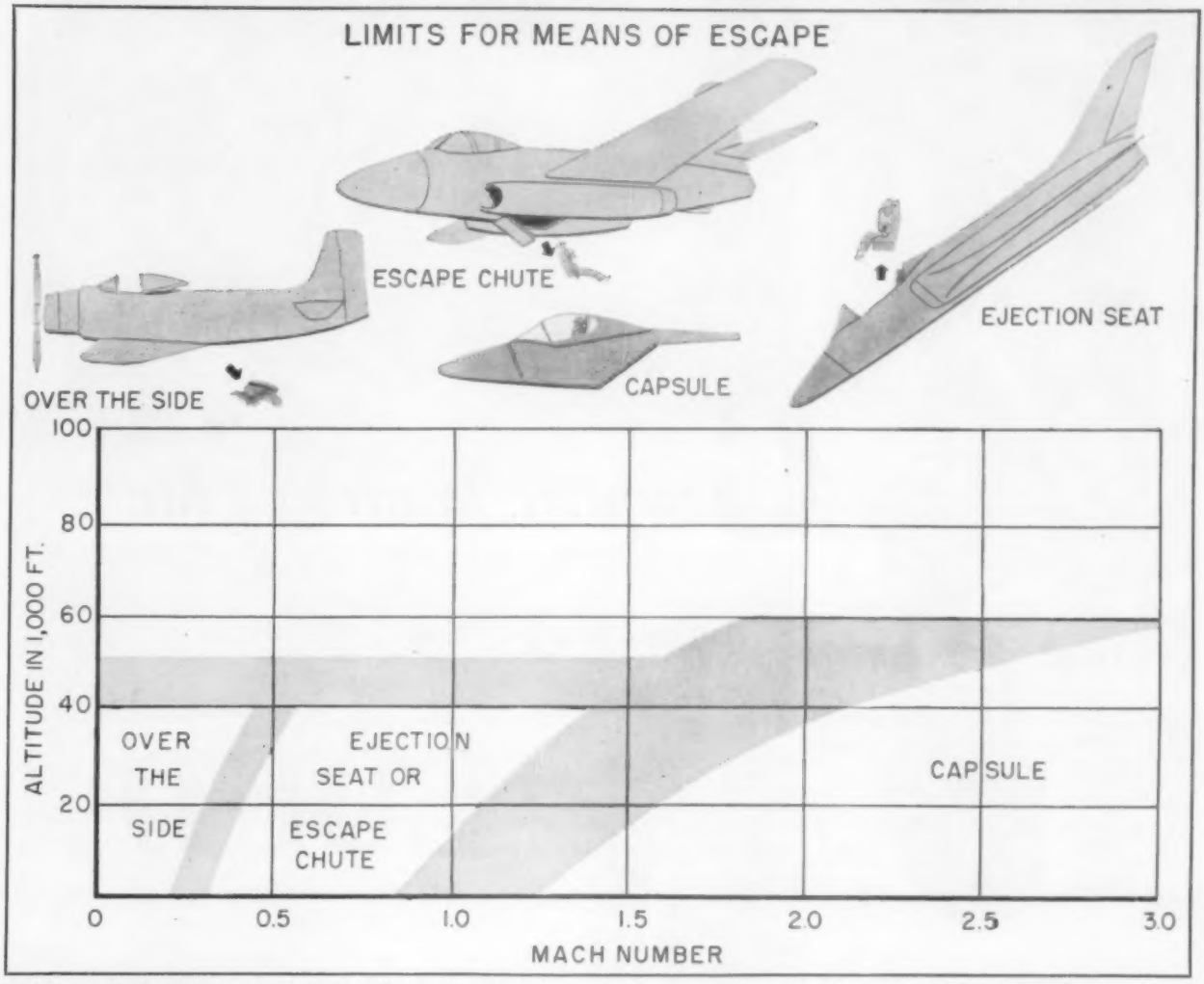
The more you know about the weather, the greater your chance of predicting its performance. The same is true of the products that power and protect your engine.

Pilots who use Mobilgas Aircraft and Mobiloil Aero know they exceed rigorous Army and Navy specifications . . . that they've been first choice of air pioneers—Lindbergh, Earhart, Byrd and many others. It's safe to predict that with these products in your plane your engine will run smoother . . . perform better than ever. *Fly safely . . . Fly with the Flying Red Horse!*

Mobiloil AERO

Mobilgas AIRCRAFT

SOCONY MOBIL OIL CO., INC., and Affiliates:
MAGNOLIA PETROLEUM CO., GENERAL PETROLEUM CORP.



DOUGLAS AIRCRAFT CO. chart showing limits of various means of escape from conventional over-the-side to cockpit capsules.

Pilots Demand Better Chance of Escape

By Irving Stone

Los Angeles—Test pilots, their pleas backed by experience, have bluntly warned industry engineers to provide them with escape equipment able to keep pace with the requirements of today's (and tomorrow's) supersonic aircraft.

"We know," one pilot warned during an escape symposium here, "that attempted escape above 35,000-40,000 ft. would probably prove fatal. We know that escapes at speeds that are in excess of 500 knots would probably prove fatal."

The pilot, A. Scott Crossfield, test pilot at the National Advisory Committee for Aeronautics test facility at Edwards AFB, told the 500 scientists, aeromedical researchers, industry engineers and military personnel at the symposium that the period between the development and production of new types of escape equipment must be drastically shortened.

"Expert talk," he said, "pride of authorship and standardization are the bottlenecks in the flow of this equipment to pilots."

Pilots are concerned with wind blast, free-fall spinning, premature chute opening and escape during violent maneuvers, Crossfield said.

"We know that there are the means and in fact the hardware in existence to protect against loss of equipment and wind blast, but it is not available for us.

"We know that there are means with existing equipment to stabilize the free-fall spinning tendency but it is not being provided us."

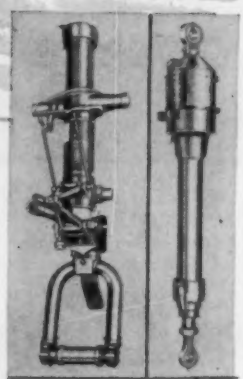
The meeting was sponsored by the Institute of Transportation and Traffic Engineering and Engineering Extension, University of California at Los Angeles, in cooperation with the Aeromedical-Engineering Assn. and the In-

Human Tolerance

"The century series of aircraft now in operational use can in level flight easily put our ejected pilot into the danger zone for human tolerance. If we plot the speed capabilities of this series . . . we can predict that an appreciable number of our estimated ejection attempts will be unsuccessful in terms of recovering a usable crew member"—Brig. Gen. Don D. Flickinger, of the Air Research and Development Command.

Complete landing gear package by

LOUD



Loud is a new source for landing gear and components on the West Coast. Versatile equipment and facilities have enabled Loud to produce shock struts, shimmy dampers, steering units, drag brace assemblies, down locks, landing gear trunnions and actuating cylinders... a complete package for the aircraft industry.

Loud has experience in newer designs employing high heat treats of 260-280,000 psi and new materials such as Hy-Tuf and Titanium, which are now required in producing modern landing gear and components.

"Producing Today...
Tomorrow's Aircraft Requirements"

Engineering and design development by
Haskel Engineering Associates
Glendale, California

•

National Sales and Service by
Haskel-Loud Aircraft Service Corp.
Glendale, California

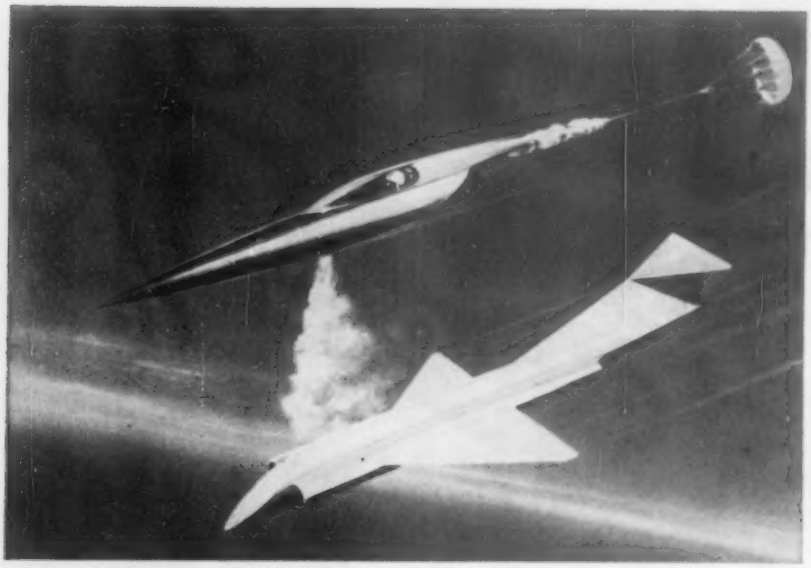
•

Resident Sales Engineers located in
Seattle, Wash.
Kansas City (Independence), Mo.
Baltimore, Md.

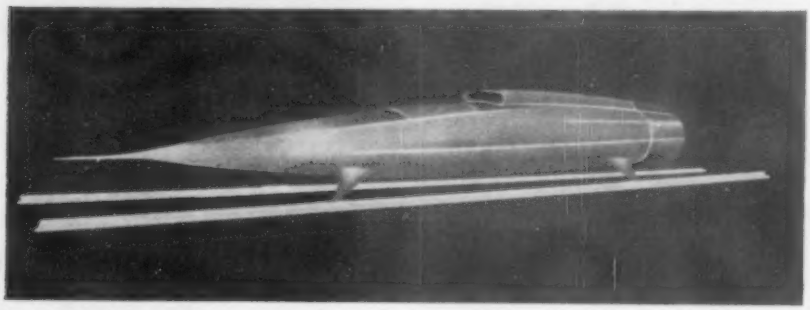
H.W.

H. W. LOUD MACHINE WORKS, INC.

969 EAST SECOND STREET, DEPT. 10 • POMONA, CALIFORNIA



ESCAPE CAPSULE for high-altitude planes as foreseen by Douglas Aircraft engineers.



SEAT-EJECTION sled presumably designed to check ejection scheme for Republic F-103.

stitute of the Aeronautical Sciences.

There, a research spokesman told AVIATION WEEK:

"There is a need for getting experimental escape hardware out of the laboratory stage quickly and into the applied stage in aircraft. Closer liaison between aero-medical researchers and designers will result in quicker transition of test results into actual hardware."

Herman Salmon, Lockheed's chief test pilot, added: "We now use subsonic equipment for supersonic flight. Subsonic equipment is not adequate."

Progress Report

In the face of this criticism, Air Force and Navy spokesmen reported on the progress of development of escape capsules.

A. B. Nutt, chief of escape development section, Wright Air Development Center, said most of the WADC effort has been applied to two programs. One involved development by the prime aircraft contractor of a capsule for a current weapon system. This capsule ejects downward with the crewman in the seated position. Capsule is pressurized during the descent after escape and is stabilized by fins which deploy on two booms immediately after initiation of the one-motion escape sequence. A delayed-deployment drag chute draws out the main recovery chute when speed has been sufficiently slowed.

Early full-scale subsonic drop tests indicate satisfactory performance of the stabilizing fins, and so do supersonic model tests. Supersonic track tests are scheduled for early 1956. Weight penalty for the capsule will be about 1,000 lbs.

Another capsule program, conducted by WADC's Aircraft Laboratory under contract, features a unit which will introduce a weight penalty of only 150 lbs. This is achieved by using the aircraft canopy and windshield as the upper part of the capsule. The seat, designed to transfer the pilot from the seated to the prone feet-forward position becomes the bottom of the capsule. Thrust is achieved through use of a rocket unit below the capsule. Stabilization is by an aft boom with trimmers.

Wind tunnel tests have indicated that satisfactory performance of the stabilizing device may be expected. Subsonic half-scale flight tests are scheduled this fall. Full-scale supersonic track tests are programmed for the summer of 1956. A full-scale mockup has

marion
advancement in instrument design

SETTING NEW STANDARDS

rugged, lightweight, miniature COAXIAL* mechanism

MEP-2D

An entirely new approach to the mechanical design of moving coil mechanisms, resulting in performance and durability exceeding that of larger, heavier mechanisms. Particularly suited to aircraft applications, as the basic mechanism in indicating instruments or a component of equipment utilizing the moving coil principle. Coaxial assembly provides self-shielded, uniform and stable magnetic field of great strength. Only two fasteners are used in the simple, rigid, interlocked assembly. Technical data for your application on request.

Actual Size
Total Weight 0.8 oz.

*Trademark for a basic Marion moving coil mechanism. Patents pending.

marion meters

marion electrical instrument company

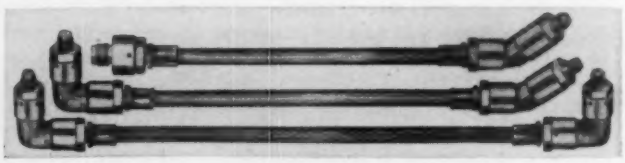
GRENIER FIELD, New Hampshire's NEW Air-Industry Area

MANCHESTER, N. H., U. S. A.

A blanket of fog needn't turn into a shroud. Equip your plane with a LEAR ARCON.
NEVER fly in instrument weather without an instrument rating!

Lightweight—Withstands Temperatures—150° F. to + 500° F.

1. "Teflon" tubing
   * "Teflon" is the DuPont registered trade mark for its tetrafluoroethylene resin.
   a. Impervious to any known acid.
   b. Unaffected by weather—withstands temperatures—150° to + 500° F.
   c. Non flammable.
2. "TEF-FLEX" hose is braided with stainless steel wire for hoop strength and tensile strength.
3. Permanent swage ferrules, leakproof high pressure fittings.
4. This special designed stem permits retraction of nut for ease of installation in any application; also allows visual inspection of 37° seat.
5. All assemblies in dash sizes 4 through 20 utilize standard AN-818 nuts or end fittings to customer specifications.



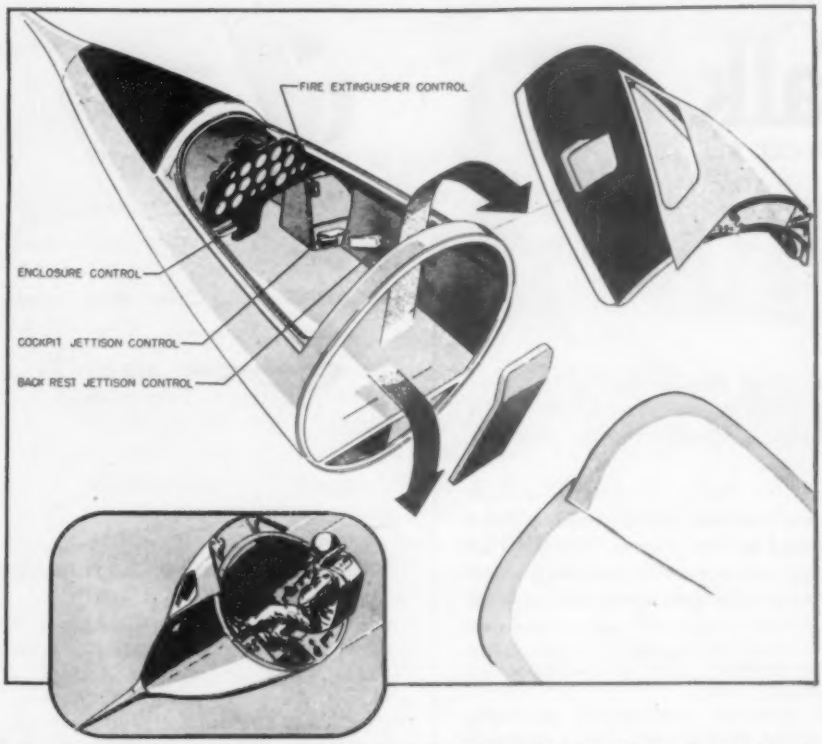
Alternate design permits use of our MIL-J-5513A tested swivel fittings.

Write for our Latest Bulletin on TEF-FLEX

AIRCRAFT
COMPONENTS DIVISION
DUNBAR KAPPLE, Inc.

Batavia, Illinois
Phone: Batavia 5400

Designers and Producers of SPIRAL-FLEX metal hose, PARA-FLEX metal ducting and Swivel Joints



D-558 ESCAPE unit. At lower altitude pilot drops back rest (inset) and falls free.

proved the feasibility of the collapsible seat.

Paul D. Dugan, head of the Navy's Bureau of Aeronautics cockpit systems unit, reported that the Navy is continuing investigation and development of capsule type escape. No immediate plans have been made for incorporation of seat capsules. However, based on a recent directive, he said, all designs of future Navy aircraft which are capable of Mach 1 sealevel performance (which would be accompanied by dynamic pressures of 1,500 lb per sq. ft or more) are to have a design study made to determine whether cockpit capsule type escape can be incorporated without undue penalty to the airplane.

Ejection Seat Limits

Recapping the escape picture as he sees it, Dugan said that ejection seat use is limited to conditions approximating those at Mach 1 at sea level and corresponding speeds at higher altitudes.

"We may be able to extend those limits somewhat by development of means of slowing down the aircraft prior to ejection by incorporation of stabilizing means and by addition of weight to the seat . . ."

Various capsule escape systems were briefly mentioned by Douglas El Segundo Division's A. M. Mayo, chief of the equipment and interiors engineering section. These included a jettisonable nose unit and ejection seat capsule, an ejectable cockpit capsule and a unit comprising the forward fuselage section of a high speed altitude aircraft design.

Mayo said that operational conditions are being approached that are clearly beyond the capabilities of the ejection seat. The cockpit capsule, he pointed out, offers greater flexibility with respect to streamlining and the amount of useful equipment capable of being included in the escape section. He added that the overall weight penalty of the cockpit capsule system may be less than that of an ejection seat system, with satisfactory drag-weight characteristics, for sealevel speeds that in some cases may approach values as low as Mach 1. The additional environmental and water survival capabilities inherent in the cockpit capsule could well swing the pendulum in its favor in some borderline cases.

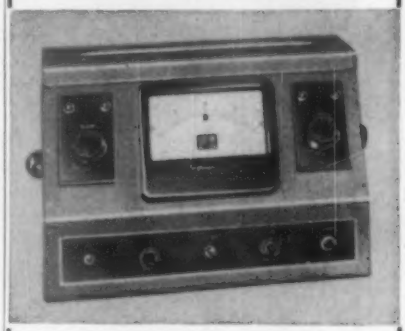
USAF's Lt. Col. John P. Stapp, pioneer in aviation biophysics, told the meeting: "Between 500-600 knots the ability of the present ejection seat to save the pilot begins to fall away."

He reported that a number of production fighter and bomber aircraft have already been equipped with subsonic type ejection seats which are inadequate above Mach 1, even though these planes are capable of considerably higher performance.

It is essential, he said, to extend the useful range of the existing seat by retrofit or replacement so that escape under maximum performance conditions can be made from these fighters and bombers.

D&B RESEARCH

BALANCING MACHINE



MEANS:

- LESS BALANCING TIME
- ACCURATELY BALANCED PARTS
- GREATER SENSITIVITY
- LOW OPERATING COST

Kaman Aircraft Corp Now Balances Their Helicopter Rotor Blades And Assemblies On a Dean And Benson Machine

Let Dean & Benson Staff Assist You On Your Balancing Problems— Inquiries Invited.

Dean & Benson Research, Inc.

16 RICHMOND ST. CLIFTON, N. J.

GRegory 1-1600

(Advertisement)

Valve Talk

for WM. R. WHITTAKER CO., Ltd.

by Marvin Miles,
Senior Member, Aviation Writers Assn.

Now that the Air Force is eliminating design studies in favor of Phase I contracts so far as aircraft are concerned, why can't the major companies apply a similar program to the supplier field?

It's worth serious consideration, for doing away with design studies in the procurement of aircraft valves, for instance, would accomplish the same goals attributed to the plan in the field of airframe procurement: save money, conserve engineering manpower, compress development time and improve the chances of obtaining a good product.

Aviation Week described the new approach as "seeing the colt, not placing the bet from the racing form." I'll carry it a step farther and say it would be seeing the colt rather than placing the bet from a single racing form selected from a group of varied forms, with those that remain rendered useless and representing pure waste in time and money.

As it is now, perhaps fifteen suppliers are asked to design for a given job. They compete helter-skelter in the hope of winning a contract. Yet they know – and the majors know, too – that only one company, possibly two, will get a production order. The rest will have devoted fruitless skill and energy to the project.

If the Air Force can pick a major company to do a job on the basis of past performance, know-how, availability of engineering effort and current work load, then there's no reason why that company itself can't select its suppliers on that same basis.

Why shouldn't the suppliers as well as the prime plants be relieved of the constant but frequently futile pressure of designing on speculation, so to speak? Why not select suppliers, too, on the basis of their past successes in the type of work required?

It would prevent spreading design talent to perilous thinness at a time when engineer availability is a critical problem. And without a doubt it would result in better products and speedier delivery – basic reasons for hand-picked Phase I contract awards.

It would also seem to go without saying that in selecting a company with a reputation for performance, an airframe manufacturer would thereby eliminate all possibility of picking itself a major headache in the form of a firm that can't produce when the chips are down or a concern that can't service its product in the field – despite the finest promises.

Certainly development contracts, rather than general design competitions, would shorten the procurement cycle in equipment and accessories just as they do in aircraft. As in the building of fighters, bombers and transports, supplier specialization invariably limits the field so far as success is concerned. It is absurd to waste precious time – as well as money and manpower – when Russia's red star is rapidly drawing abreast of us.

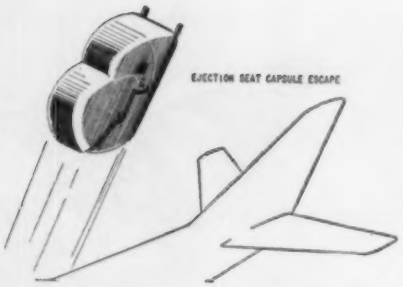
This is not to say there should be no competition. No one doubts the value of pressure in the struggle to out-do a worthy rival. As a matter of fact, the competition, although narrowed in field, would be considerably rougher.

Surely it makes sense to assign the development of special products to firms with specialist skills. Not only would it prevent the immeasurable waste of engineering manhours on projects that aren't particularly desired – but which must be sought to maintain economic levels – it would channel such projects to other concerns and spread the business equitably on a direct premise of efficiency.

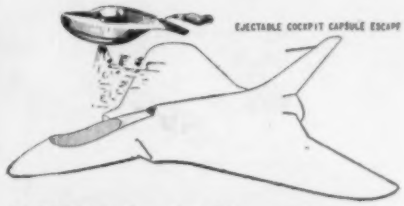
Past performance in place of paper proposals can as well be the measuring stick in development awards to the supply industry as it will be the gauge in airframe production. "Multiple sourcing" is as inefficient in one field as it is in the other, but you'll find the veteran supply houses themselves have long been placing important contracts only with vendors of proved capability.

If the prime plants don't extend the Air Force plan to the suppliers, it could be the whole program will lose a good part of the efficiency it's now expected to achieve.

It's something to think about.



GOODYEAR unit. Chute drops capsule.



PROPOSAL for ejectable cockpit capsule.

"Equipment we have should be evaluated on a very long range basis—we can't reproduce another species of man," he said. First objective in supersonic escape research should be to determine limits of human tolerance and the margin of survivability beyond this point through animal experimentation, Stapp claimed.

Human Level

Second line of attack, he said, consists of devising equipment with controlled performance under all expected conditions of escape to modify and confine the force to tolerable human levels. An essential specific problem, he added, is the full scale determination of lift and drag of the man-seat combination at all angles of presentation by means of wind tunnel experiments up to Mach 2 at sea level.

A man should be used in the tunnel tests up to Mach 1.1, after which a plaster duplicate could be used up to Mach 2, he said.

A re-examination of human tolerance in both upward and downward ejections, using additional pilot support (restraint) is long overdue, Stapp said. He reported that there have been two upward ejections at about 500 fps. at 33G without injuries. One approach for solving the problem of wind drag deceleration is to oppose wind ram force during ejection by a counter force using a propulsion means, he said.

Northrop Aircraft's George Nichols told the meeting that the escape problem must be solved soon or further loss faced in the efficiency of the weapon system. An interesting experiment in design of a new aircraft would be to bring in optimum escape factors and then compromise other conditions around these, he said.

new Boeing jet tanker to stretch America's Air Arm with mid-air refueling

Almost daily, continuous flights halfway around the World are being made because huge KC-97 tankers meet bombers for refueling in mid-air. Tankers like the Boeing KC-135 will bring "targets" on faraway Continents within striking distance. The new Boeing KC-135 will haul extra large cargoes because *added strength* with *less weight* is possible with metal honeycomb construction. Kawneer is helping build more planes like the KC-135 *faster* because of excellent metal bonding facilities to produce any kind of honeycomb assembly. Our experience in metal bonding honeycomb will be helpful to you in designing new applications of this material. This is another example of how you can benefit by Kawneer's integrated engineering and manufacturing service.

Kawneer will produce the ailerons for the KC-135 utilizing honeycomb sandwich construction

Illustrated here is the Boeing 707 Tanker-Transport prototype of the new KC-135.

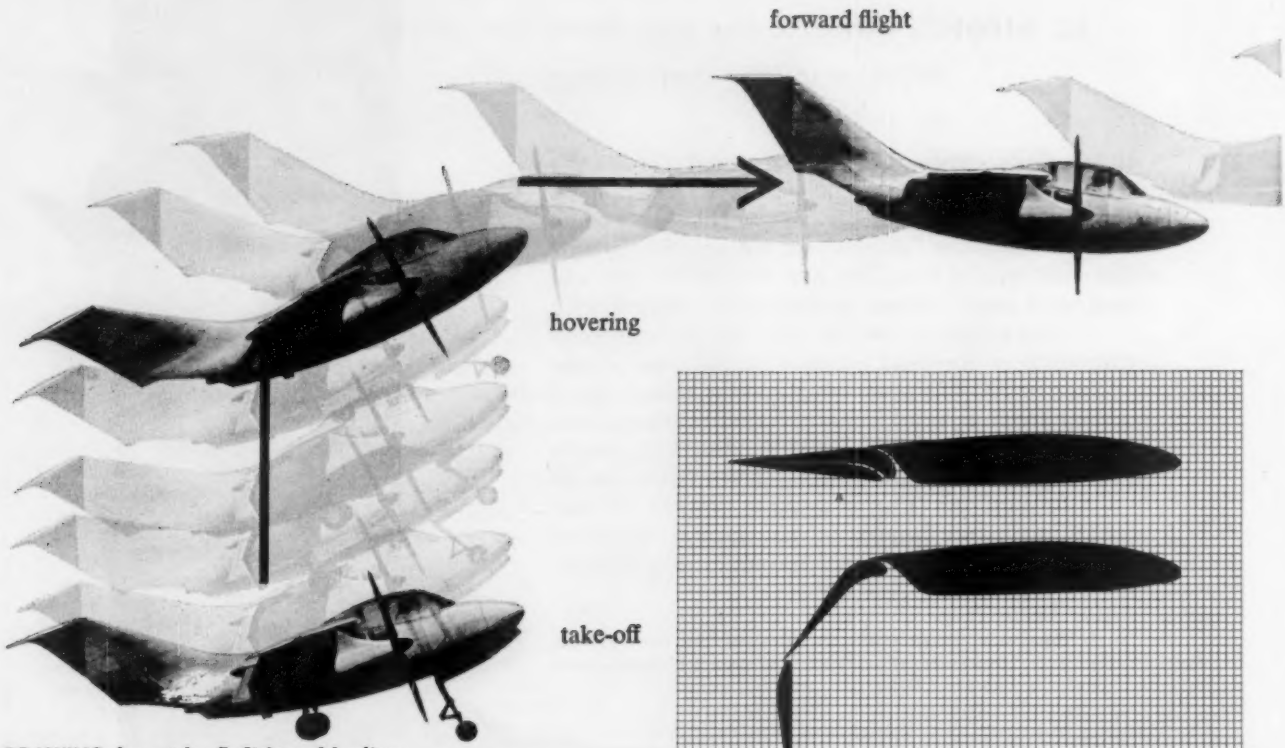
Learn more about Kawneer's Slogan– "Quality products– Economically produced– Delivered on time" *Write for this book*

Gentlemen:
Please send us .... copies of your new descriptive book to distribute to our key men.

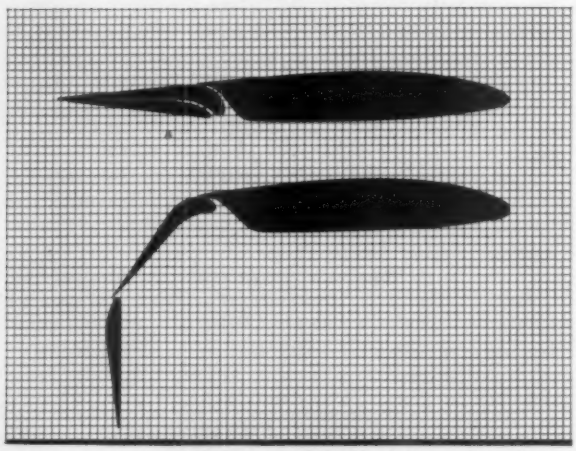
By ..... *Title* .....
Company .....
Street .....
City ..... *Zone* .... *State* .....

Kawneer
General Offices
NILES, MICHIGAN

New Vertiplane Has Conventional Look



DRAWING shows takeoff, flight and landing attitudes of proposed vertiplane.



NEW FLAP: Closed and drooped for hover.

Double Flaps Give Weber Model Vertical Takeoff Ability

By William J. Coughlin

Burbank, Calif.—Weber Aircraft Corp. is flight-testing a powered model of a new vertical rising aircraft, conventional in appearance but capable of taking off and landing with zero forward speed.

The firm hopes to interest the military services in design and construction of a low-cost research airplane for full-scale flight testing. Preliminary evaluation by Wright Air Development Center has indicated that both the concept and proposal are "feasible."

Designer of the new aircraft is Joseph L. Velazquez, former project engineer on Piasecki H-16 helicopters and now chief engineer of airplane projects at Weber.

Weber's design was evolved from basic research done by the National Advisory Committee of Aeronautics, Charles H. Zimmerman, Louis Breguet and others.

The Weber aircraft is a conventional fixed-wing aircraft with turboprop engines. To achieve its vertically rising and hovering capabilities, the design employs extended double flaps to deflect the propeller airstream from horizontal to vertical.

Aerodynamic Theory

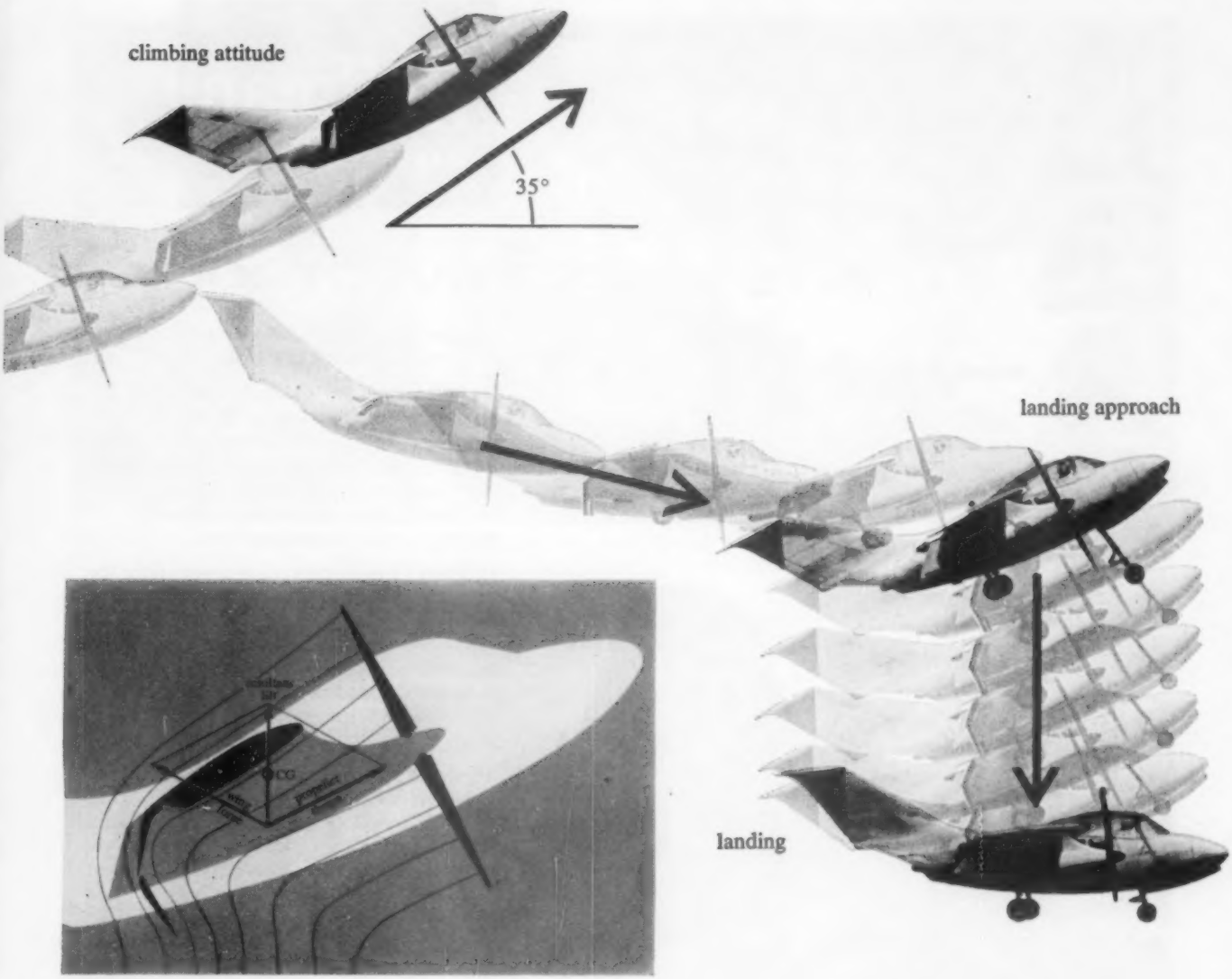
"The aerodynamic theory is not new but recent developments make this type of aircraft possible," Velazquez points out. These developments include aircraft turbine engines and controls. But the key to the Weber design is found in NACA Technical Note 3198 which indicates that all that is required to produce vertical lift without a horizontal component is to impart a sufficient downward acceleration to a sufficient mass of air.

Helicopters achieve this by imparting a relatively low velocity to a large mass of air. Designs such as the Convair and Lockheed vertical rising fighters accomplish it by imparting a relatively high velocity to a smaller mass of air.

Velazquez points out that it is not necessary for the thrust line of the propeller rotor to be in a vertical direction to produce the downward acceleration of air. He contends that the same result can be obtained by redirecting the slipstream by means of a wing and flaps.

Although the wing, engines and propellers remain in a conventional attitude, the flap arrangement will produce a purely vertical force on the aircraft, according to the Weber designer.

He cites recent NACA wind tunnel tests which show that it is possible to obtain a change in direction of the propeler thrust by as much as 72-deg. with only 10% loss of magnitude.



SCHEMATIC of slipstream over wing and flap creating vertical lift.

One difficulty in the past has been that the large degree of flap required for such an effect produces an uncontrollable nose-down pitching moment. Horizontal tail surfaces, ineffective at zero speed, cannot trim this out.

The answer to the pitching moment problem is the heart of the Weber design. The solution offered is placement of the propeller thrust line below the aerodynamic center of the wing. This downward displacement of the thrust line combines with wing lift, drag and pitching moment to act through the aircraft's center of gravity.

"Pitching equilibrium then results about the airplane's center of gravity," Velazquez says. "Under such conditions, the nose-down pitching moment resulting from extension of the flaps is balanced by the nose-up pitching moment introduced by the propeller thrust."

To reduce cost of the initial airplane, the company proposes that an Ercoupe two-place airframe be converted into a one-place research aircraft to test the theory involved. After early flight testing in a stripped-down configuration, which would not have canopy, fairings or retractable gear, the aircraft would be completed prior to its final flight testing.

The WV-1 would have a 30-ft. wingspan, 20-ft. 6-in. length and a design hovering weight of 2,200 lb. with a useful load of 600 lb. It would be powered by a Continental T51 turboprop engine, the U. S. version of the Turbomeca Artouste II, rated at 425-hp.

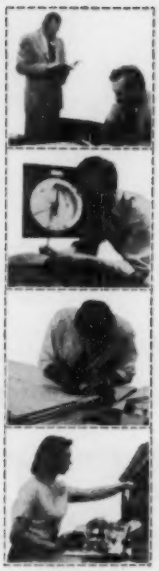
Velazquez says the WV-1 flight test program would seek solutions to these problems:

- **Amount of buffeting during transition** due to stalled portions of the wing not immersed in the propeller slipstream.
- **Trim changes due to ground effect.**
- **Possible dynamic instability** in hovering or transition.
- **Possible propeller vibration** during transition due to high angle of attack.
- **Effect of ground cushioning.**
- **Deviations from NACA test data.**

NACA Wind Tunnel Tests

Studies leading to this design were largely theoretical until last year when NACA conducted wind tunnel tests on the principles involved. These tests support Velazquez in his design theories.

"It is only since these test results were made available that it has become possible to design a hovering airplane with accurately predictable hovering performance, including power required and hovering attitude," says the Weber designer. It was after this information was made public that the WV-1 evolved from a variable-incidence wing design



research*

development

design

production

Hoffman
LABORATORIES, INC.

A SUBSIDIARY OF HOFFMAN ELECTRONICS CORPORATION

INTEGRATED ELECTRONICS

NUMBER 4 OF A SERIES

THE IMAGINATION FOR RESEARCH PLUS THE SKILLS FOR PRODUCTION

Performance in the field is the real test of product worth. To maintain Hoffman's reputation for high standards of quality and performance, Field Engineers are constantly performing direct, on-the-spot aid in installation, operation, and evaluation of Hoffman electronic equipment.

Hoffman Field Engineers are chosen from the engineering design and test groups for their specialized knowledge and ability. These specially trained, specialized engineers carry the integrated skills of research, development, design, and production into the field . . . wherever Hoffman equipment is being used . . . on land, air, sea, or undersea.

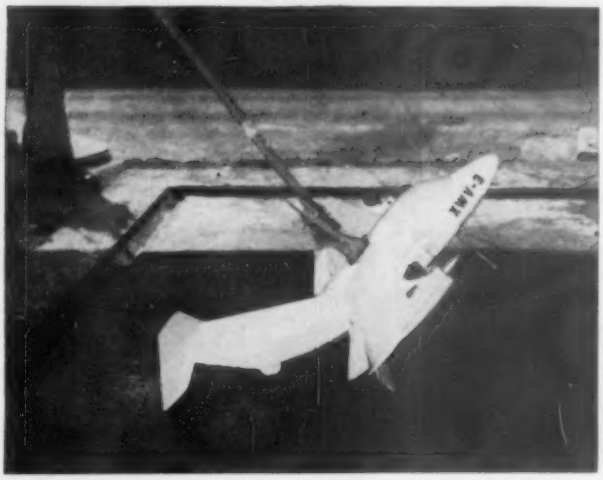
Typical of the types of projects Hoffman Field Engineers are working on, one group is presently engaged in conducting field evaluation studies at remote air bases on TACAN, the most advanced airborne navigation equipment yet produced. This field study is being coordinated with Hoffman's production of TACAN equipment.

Radar, Navigational Gear
Missile Guidance & Control Systems
Noise Reduction
Countermeasures (ECM)
Communications
Transistor Applications

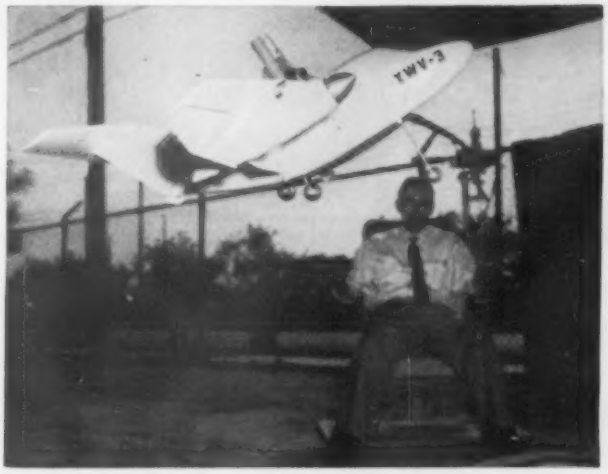
CHALLENGING OPPORTUNITIES FOR OUTSTANDING ENGINEERS TO WORK IN AN ATMOSPHERE OF CREATIVE ENGINEERING. WRITE THE DIRECTOR OF ENGINEERING, HOFFMAN LABORATORIES, INC., 3761 SOUTH HILL STREET, LOS ANGELES 7, CALIFORNIA.

DESIGNER VELAZQUEZ at control chair . . .

Puts his vertiplane model through paces. Note extended flaps for hovering.



WEBER VERTIPLANE model hovers just off ground in nose-up attitude with flaps fully extended.



Then, at Velazquez's command, the model climbs for enough altitude to revert to normal flight attitude.

conceived earlier by Velazquez.

WV-1 is designed for takeoff, hovering and landing in a 25-deg. nose-up attitude. "It appears that the best design compromise is . . . where the hovering attitude nose-up angle is in the same order of magnitude as for present day sweptback or delta-wing fighter aircraft," says the designer.

Flight testing of a gasoline-powered one-tenth scale model now is under way at the company's Burbank plant. The test rig employs an operator's seat with a free-swinging helicopter-type arm extending out to the model, which is free to move in a circular path or to rise and descend vertically.

The twin-engine wooden model employs double flaps as its only movable control surfaces. Angle of attack is controlled by movements of the rotor arm and engine power is adjusted by a throttle on the operator's chair.

"The model is proving out our theory," Velazquez reports.

Transition to Horizontal

Horizontal flight characteristics of the WV-1 are expected to be those obtained with the conventional elevator, aileron and rudder control surfaces which it employs. Vertical takeoff and transition to horizontal flight would be accomplished in this manner: Nose gear would be extended to bring the aircraft from its level ground attitude to takeoff angle of about 25-deg. Increase in power and blade angle of the constant-speed propellers would lift the aircraft into hovering flight.

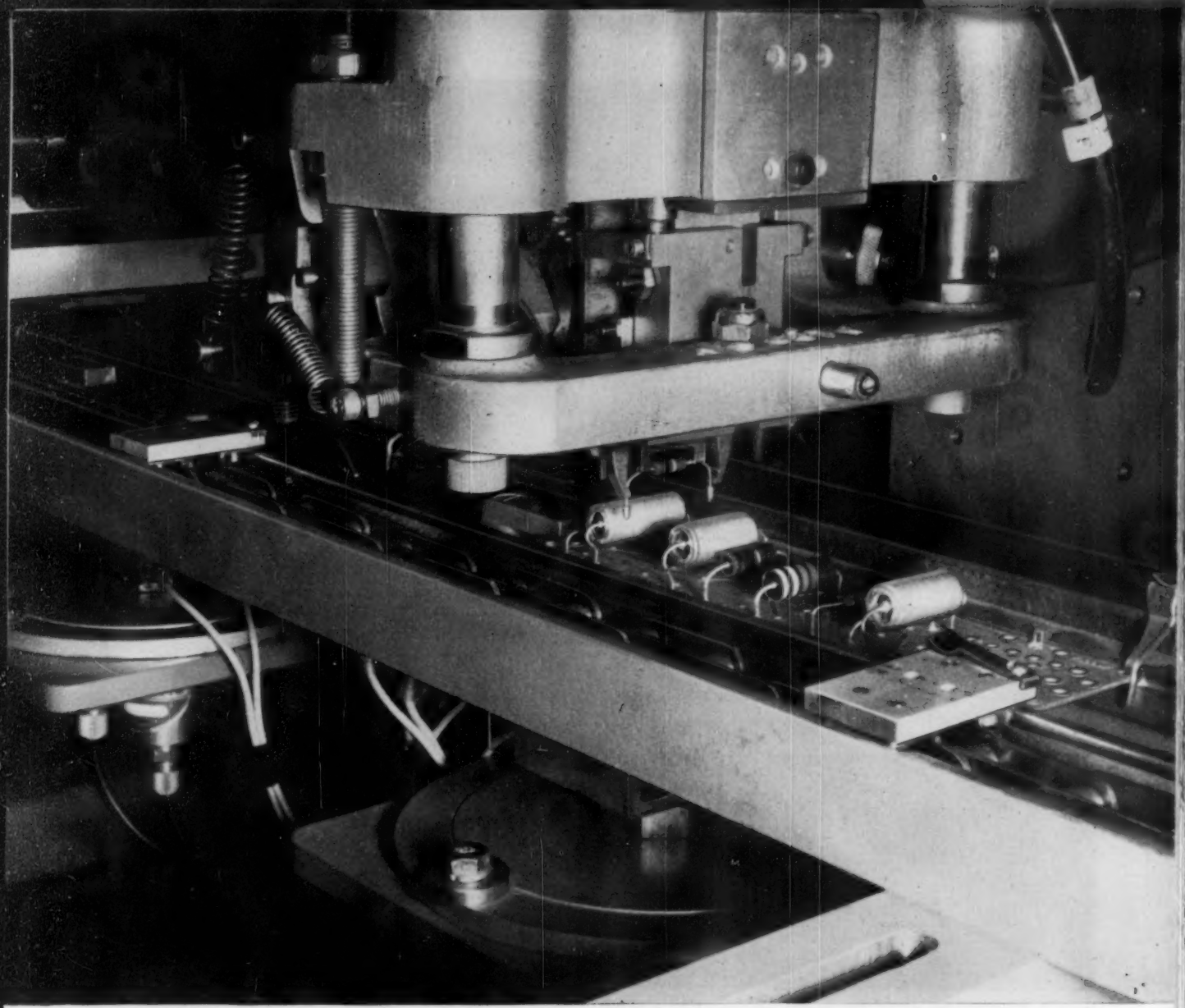
The nose would be lowered to cruising or climb attitude for forward flight as flaps retracted into their position as trailing edges of the straight wing.

Landing procedure would be somewhat similar to a partial-power carrier landing. Flaps would extend gradually as power was added, nose lifted and speed reduced. After a nose-high, zero-speed hovering condition was achieved, descent would be made by a slight decrease in power.

In the zero-speed hovering condition, roll would be controlled by engine differential, either through power changes or change in blade angle; yaw by differential use of flaps, and pitch by simultaneous flap changes. Conventional stick and rudder movements would be employed for all these in an admittedly complex control system.

Air Support Vehicle

Charles L. Buckley, vice president of Weber, believes the Weber VRA (vertical rising aircraft) would be excellent



THIS IS AUTOFAB, an automatic machine that assembles 9,600 electronic circuits in a single working day. Designed, built and offered for sale by General Mills, *Autofab* assembles printed circuits (complete with practically all radio and TV components) at lower cost than ever before. Components can be attached at any angle and at any position on the base plate.

AUTOMATION? Consult a pioneer in the field

Autofab is an outgrowth of General Mills' 28 years of experience in the design and production of automatic processing and packaging equipment. Our staff is thoroughly experienced in the theory and practice of automation; our complete facilities and a diversified staff of 2,000 enable us to carry entire projects from the research stage to final production in quantity.

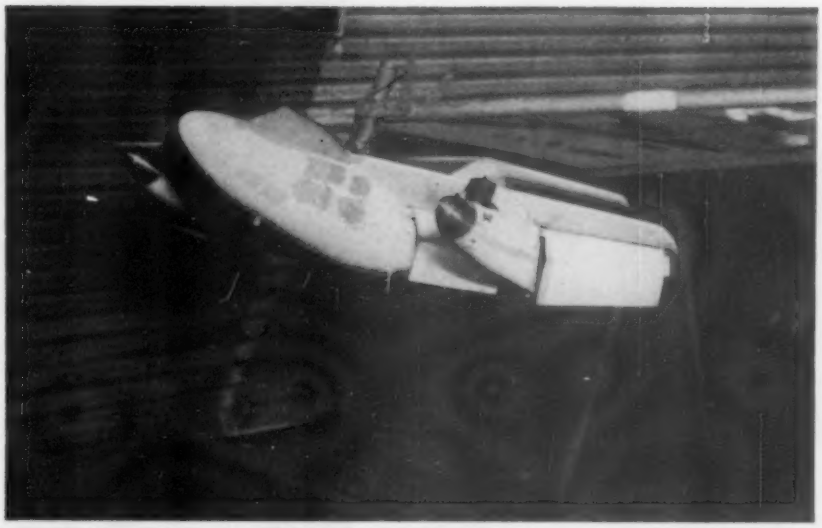
Autofab is a GMI trademark.

WHAT'S YOUR PROBLEM? General Mills can help you with research, design, development, production engineering and precision manufacturing in connection with • automation • bombing, navigation and missile control systems • industrial instrumentation and control • specialized precision instrumentation • electro-mechanical computers • remotely-controlled manipulators • fine-particle technology • meteorological and high-altitude research.

JUST OFF THE PRESS is a new booklet describing the services available to you at the Mechanical Division. An 8-page brochure with details of the *Autofab* machine is also available. For either or both, address Dept. **AW-4,** Mechanical Division of General Mills, 1620 Central Avenue, Minneapolis 13, Minn.

Job opportunities available for creative engineers. Work closely with outstanding men on interesting projects.

MECHANICAL DIVISION OF General Mills, Inc.



FRONT VIEW of hovering model shows how double flaps fit around engine nacelle.

for logistic and tactical air support, combining the range, speed and reliability of a conventional aircraft with the vertical characteristics of a helicopter.

Although Weber studies indicate that such an aircraft would have payloads below those of a comparable helicopter, the rate of cargo delivery could be much higher due to cruising speeds greater than those of the helicopter. When operating where runways were available, its payload could be greatly increased by conventional horizontal takeoffs.

The ability to make either horizontal or vertical takeoffs would be a great advantage over a tail-sitting vertical takeoff aircraft, Buckley notes.

On longer missions, the Weber VRA could make a heavily loaded horizontal takeoff and then land vertically in a combat area after using up fuel weight en route.

The WV-4 cargo version would have a top speed of 452 knots, cruise at 301 knots and have an effective range of 1,820 nautical miles at full payload, according to Weber calculations. Conventional takeoff might permit gross weight to climb from 45,000 to 70,000 lb.

Buckley believes the cost of any of the WV series should not be more than that of a helicopter of the same gross weight.

Weber's Work

Weber Aircraft Corp., with a plant area of 211,722 sq. ft., presently designs and manufactures aircraft interior equipment as well as doing subcontract work on major airframe components. Weber ejection seats are used on the Boeing B-47 and B-52, Convair F-102, McDonnell F-101 and Cessna T-37.

During World War II, the firm's facilities were used for fabrication and final assembly of more than 40 P-38 aircraft and over 400 Lockheed Lodestars.

A separate engineering division was set up at Weber two years ago for research and development in rotary-wing aircraft. It was at this time that Velazquez joined the firm.

The helicopter projects since have been shelved to concentrate on his VRA design.

Velazquez, after receiving a Master of Science degree in aeronautical engineering from the California Institute of Technology, was employed as structures engineer at the Douglas Aircraft Co. from 1939-1944, served with the Navy Bureau of Aeronautics between 1944-1946, worked as structures engineer at North American Aviation, 1946-1948, and joined Piasecki in 1948. He came to Weber as chief engineer, airplane projects, in May of last year.

Prefab Heliports

Manufacture of all-steel prefabricated heliports has been announced by Dravo Corp., Pittsburgh.

The heliports consist of structurally supported sections of open steel grating which serve as landing and takeoff pads for the helicopter. The open grating provides proper drainage and carries away excess air churned by the rotor.

For water-based use, the heliport's flight deck is constructed of 10x40-ft. sections with automatic stabilizing provided by pivotally-mounted floats which cushion the impact of landings and takeoffs.

The floating platform may be anchored in as little as 2½ feet of water.

The prefab heliport design was developed by Standard Heliports, Inc., Minneapolis, under whose license Dravo will operate.

STEEL

Every Kind

Quick Delivery

Plates, Structurals, Bars, Sheets, Tubes, etc. Carbon, Alloy, Stainless Steels, Babbitt Metal.

RYERSON

Joseph T. Ryerson & Son, Inc. Plants: New York, Boston, Philadelphia, Charlotte, Detroit, Cincinnati, Cleveland, Pittsburgh, Buffalo, Milwaukee, Chicago, St. Louis, Seattle, Spokane, Los Angeles, San Francisco

Can you make 120 rudder corrections per minute? Ten times more, if needed, can be made electronically and smoothly by a **LEAR ARCON.**

NEVER fly in instrument weather without an instrument rating!

FOR SPATIAL REFERENCE

Gyros

BY

Greenleaf

QUALITY ABOVE ALL!

HIG-4 GYRO

DATA

1. Spin Motor: 12 Volts A.C., 400 cps, 2 phase
2. Power Required: Running 1.5 Watts—Start 2.2 Watts
3. Run-up Time: 15 Seconds Maximum
4. Angular Momentum: 10^4 Gram-Centimeter^2/second
5. Gimbal Travel: ± 5° Maximum
6. Signal Generator Sensitivity: 10 mv/mr, with 55 m/a, 400 cps
7. Signal Generator Linearity Deviation: ± 1%
8. Torque Generator Linearity Deviation: Less than 1%
9. Input Rate: 4 Radians/second Maximum
10. Drift Rate: 1° per hour maximum
11. Weight: 1.5 pounds

NOTE: *This Gyro can be readily modified to meet your requirements. We invite inquiries listing specifications.*

The Greenleaf Line of Gyros and associated devices is being steadily expanded. It now includes a wide selection of Free and Rate Gyros, and the HIG-3 and HIG-4 Gyros.

Write, wire or phone for further information.

ENGINEERING · DEVELOPMENT · PRODUCTION

THE Greenleaf MANUFACTURING COMPANY

7814 W. Maplewood Industrial Court • Saint Louis 17, Missouri

Producers of the HIG-3 and HIG-4 Gyros, Rate and Free Gyros, Differential Pressure Mach Meters, Air Speed Indicators, Computers, Switches and many other precision-built components.

At Greenleaf Plant No. 2 facilities are available for precision castings.

USAF Contracts

Following is a list of unclassified contracts for $25,000 and over as released by Air Force Contracting Offices:

ROBINS AIR FORCE BASE, Macon, Ga.

Glenn L. Martin Co., Baltimore, Md., repair and modification of TM-61 series missiles (PR-584[illegible]), $386,784.

Western Electric Co., 120 Broadway, New York, N. Y., printing and distribution of technical orders, (PR-548492), $60,000.

Ideal Electric & Mfg. Co., Mansfield, Ohio, motor generator sets, type MC-1, 47 ea., (RFP-1246), $842,016.

WRIGHT-PATTERSON AIR FORCE BASE, Ohio.

General Mills, Inc. (Mechanical Division), 1620 Central Ave., Minneapolis, Minn., overhaul, repair and modernization of MA-4 optical group assy., (PR 584464), $531,087.

Sperry Gyroscope Co., Great Neck, Long Island, N. Y., essential repair and/or modification of A-1A bombing navig. computor, systems, assemblies, sub-assemblies, and/or components, (PR 584536), $554,278.

AC Spark Plug Division, 1300 N. Dort Highway, Flint, Mich., modification, repair and overhaul of A-1A bombing navig. computors, (PR 584538), $1,844,136.

National Cash Register Co., South Main and "K" Sts., Dayton, Ohio, modification, repair and overhaul of A-1A bombing navig. computors, (PR 584532), $1,620,000.

Stewart-Warner Electronics Div., 1300 North Kostner Ave., Chicago, Ill., receiver-transmitter BC-788E/SCR-718E, 81 ea., receiver-transmitter BC-788E/SCR-718E, 31 ea., indicator I-152E/SCR-718E, 96 ea., (PR's PE-158413 and GE-557769), $107,918.

David Bogen Co., Inc., 29 Ninth Ave., New York, N. Y., public address set AN/AIC-11(XA-2), 2 ea., engineering data, handbook of operating & maint. instruction, (PR 158667), $157,837.

Navy Contracts

Following is a list of unclassified contracts of $25,000 and over as released by Navy Contracting Offices:

AVIATION SUPPLY OFFICE, Philadelphia.

Walter Kidde & Co., Inc., 675 Main St., Belleville 9, N. J., cartridges, (383/2110-1663/51-1441/52-1450/50), 13,208 ea., $40,813.

North American Aviation, Inc., Columbus Division, 4300 E. Fifth Ave., Columbus, Ohio, ground handling equipment for AJ and FJ aircraft, (383/2110-1402/52), various, $46,751.

Sperry Gyroscope Co., Great Neck, L. I., N. Y., klystron signal source and directional coupler, (PREN 11-3935-55/aero), various, $26,780.

Goodyear Tire & Rubber Co., Inc., 1144 East Market Street, Akron, Ohio, wheel assys., (383/2110-1376/52), 420 ea., $76,810; brake assys. (383/2110-1483/50, 105/54), 195 ea., $48,516.

Pesco Products Div., Borg-Warner Corp., 24700 North Miles Rd., Bedford, Ohio, fuel pumps, (383/2116-24/54), 348 ea., $48,310.

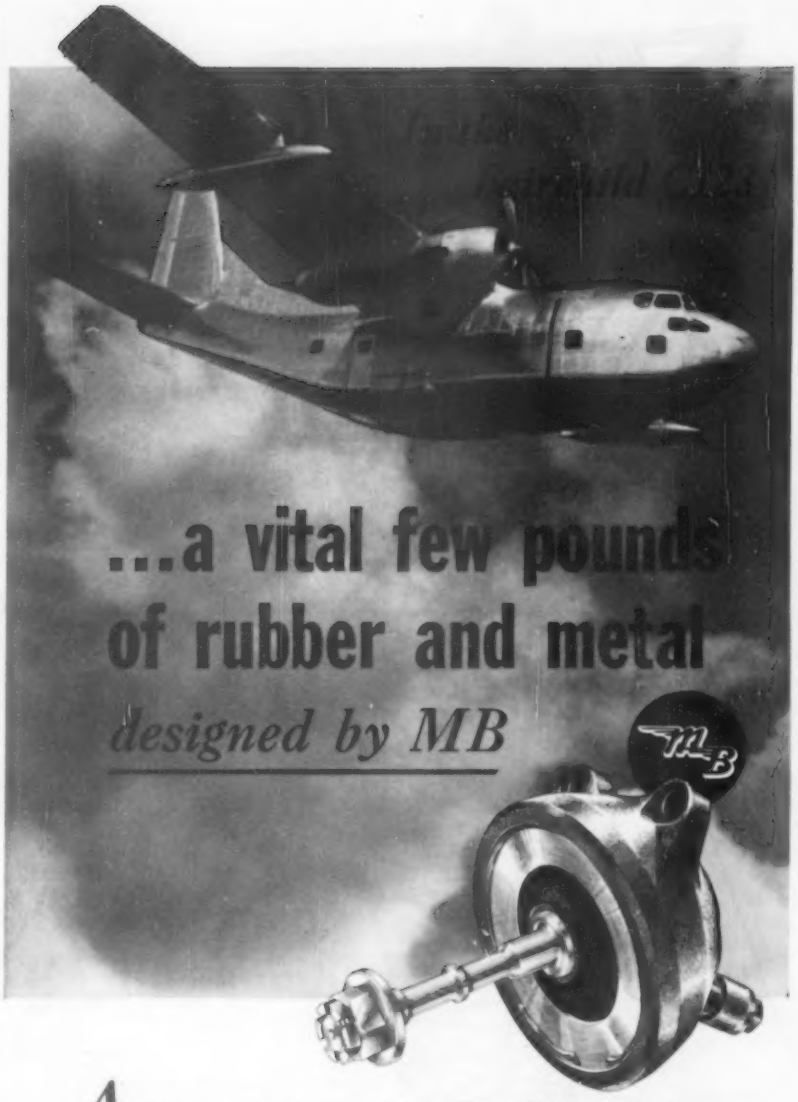
Scintilla Div., Bendix Aviation Corp., Sidney, N. Y., connectors, (383/2140-1866/52), various, $36,455.

General Tire and Rubber Co., 1708 Englewood Avenue, Akron 9, Ohio, wheel assys., (383/2110-1333/52, 72/54), 1,106 ea., $41,364.

Airborne Accessories Corp., 1414 Chestnut Ave., Hillside, N. J., actuators, (383/2110-1479/50, 95/54), 42 ea., $30,906.

Bendix Products Div., Bendix Aviation Corp., 410 Bendix Drive, South Bend, Ind., maintenance parts for overhaul of Bendix pumps, (383/2117-182/50), various, $782,272; brake, wheel assys. and maintenance parts for various aircraft, (383/29043-74X1/56), various, $41,237.

Zak-Lac Paint & Lacquer Corp., 250 Simpson St., N. W., Atlanta, Ga., enamel, (IFB-383-775-55), 22,905 gal., $29,729.



All the power and torque of the engines of Fairchild's Cargo Transport pass through a few pounds of rubber and metal . . . leaving most of the vibration behind. *MB* engine mounts do the job.

These lightweight Type 3900 MB units have USAF, BuAER and CAA approval. They were designed for airplanes powered by P&WA R-2800C engines.

Many other planes are made bearable for their crews, instruments, and structure by specially-designed MB power plant mounts. You'll find the leading producers of the industry among the other manufacturers who have drawn on MB's 15-year-old fund of busy experience in vibration isolation, measurement and excitation.

For help on the vibration control job now on your boards, just write or call.

the MB manufacturing company
A division of Textron American, Inc.
1060 State Street, New Haven 11, Conn.

HEADQUARTERS FOR PRODUCTS TO ISOLATE VIBRATION
. . . TO EXCITE IT . . . TO MEASURE IT

RADIO WITH A ROUND-TRIP TICKET

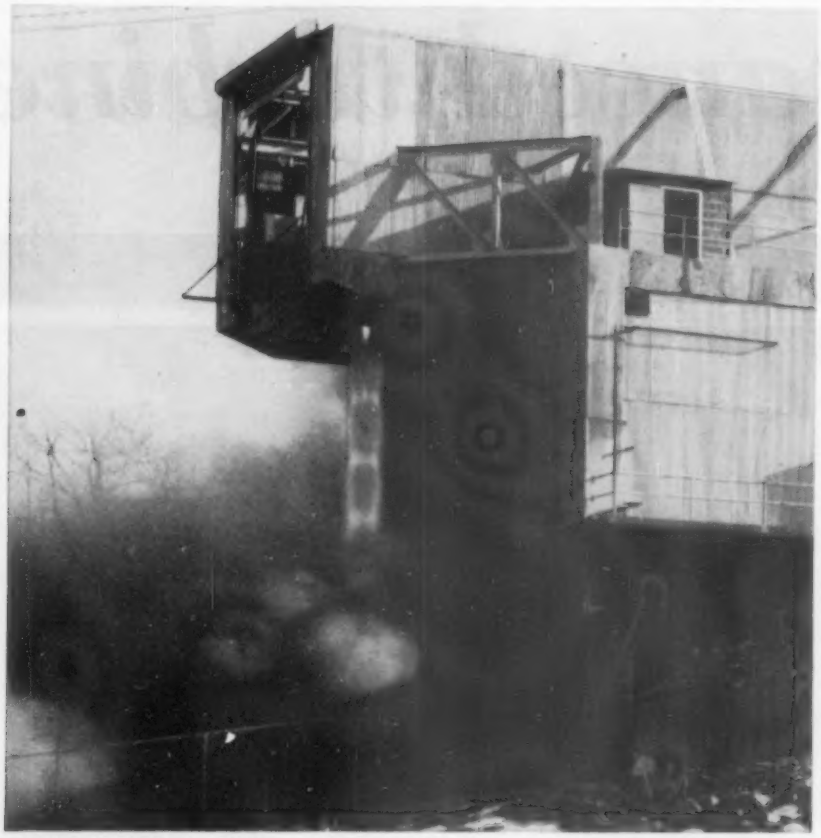
COZI—short for Communication Zone Indicator—is a new and different type of "radar" developed by the Air Force and Raytheon. It gives a big assist to high frequency radio contacts by telling which frequencies to use for best communications to any area—and whether the signal is being jammed.

COZI is also working for the Voice of America and Radio Free Europe. It's one more example of Raytheon's ability to handle tough engineering problems in any range of frequencies . . . and of "Excellence in Electronics."

RAYTHEON

RAYTHEON MANUFACTURING COMPANY

WALTHAM 54, MASSACHUSETTS



ROCKET MOTORS for Viking are checked in big stand overlooking RMI test area.

Navy & Reaction Motors Open $4-Million Rocket Engine Facility

By Henry Lefer

Denville, N. J.—The U. S. Navy and the nation's oldest rocket engine company formally opened a $4-million rocket engine development and production facility earlier this month here in the rolling hills of northern New Jersey.

Built under the auspices of Reaction Motors, Inc., and the Navy, the plant consolidates within its 200,000 sq. ft. of working area RMI's administrative offices, research, engineering and manufacturing operations, that previously had been divided between Rockaway and Lake Denmark, N. J.

The company is retaining the lease on its Rockaway plant, however, for use in special projects. In addition, new administrative, test and instrumentation facilities have been constructed at a Lake Denmark test site, seven miles from the Denville headquarters and—it is hoped—far enough away from residential areas to reduce complaints about the shattering noise produced by rocket engine firing.

The Denville plant consists of three buildings—administration, engineering and research and experimental—on a 50-acre site. It was laid out with a view of achieving the most efficient communication between related departments and with an eye towards future expansion.

The administration building is located on RMI property and belongs to the company. The remainder of the new facility is on Navy-owned land and is operated by RMI under a Navy facilities contract as part of the Naval Industrial Reserve.

The 66,000-sq.-ft. engineering and research building contains laboratories, design department, project and planning offices, a library and records section. One wing is devoted to chemical and physical research. There are nine chemical laboratories, controlled humidity areas and much special equipment necessary for rocket research. The building also includes a large physics lab, a hydraulic lab and an metallurgy lab.

The 67,000-sq.-ft. experimental shop building contains production, fabrication, component test and inspection departments.

In pushing rocket development to new frontiers, Reaction Motors is working with new propellants being developed by its parent company, Olin Mathieson Chemical Corp. RMI, together with Olin Mathieson and Marquardt Aircraft Co. (in which Olin Mathieson has an interest), recently formed the OMAR group for cooperative research in propulsion and associated problems. (AW Aug. 22, p. 50).

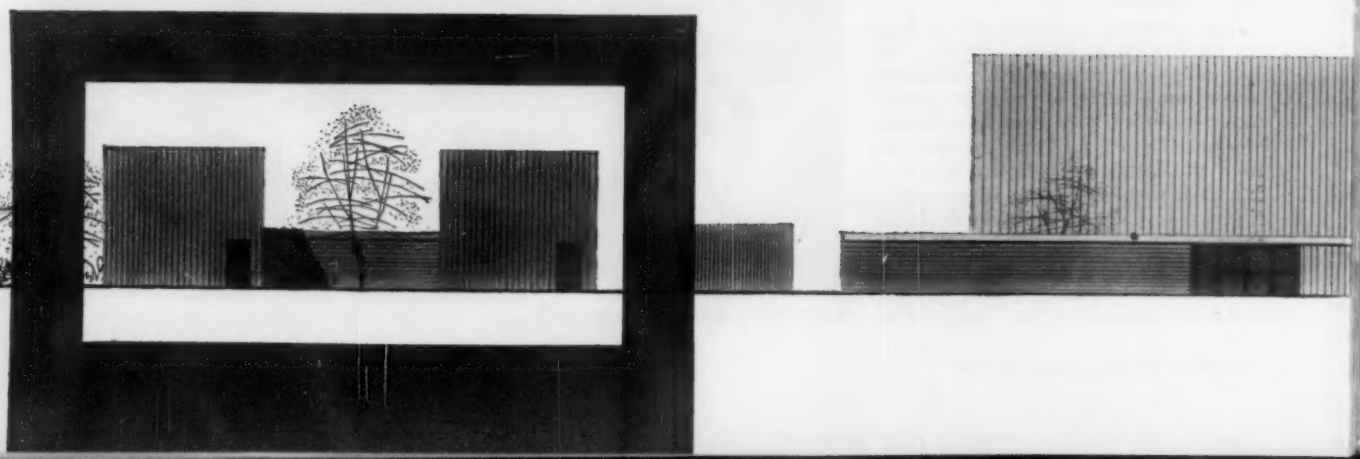
The company has not been tapped for the International Geophysical Year space satellite program, according to Raymond W. Young, RMI president, but expects to be asked to bid on the powerplants for the second or later propulsion stages when the prime contractor's designs become further advanced. General Electric has the task of developing the engine for the first stage.

The main emphasis at RMI is on liquid propellant rockets, such as the 6,000-lb.-thrust unit that powered the Bell X-1 and Douglas Skyrocket research aircraft and the 20,000-lb. motor that blasted the Martin Viking to an altitude record of 158 miles in 1954. Other developments include the ROR (rocket-on-rotor) units installed on helicopter rotor tips for auxiliary thrust (AW Sept. 27, 1954, p. 17).

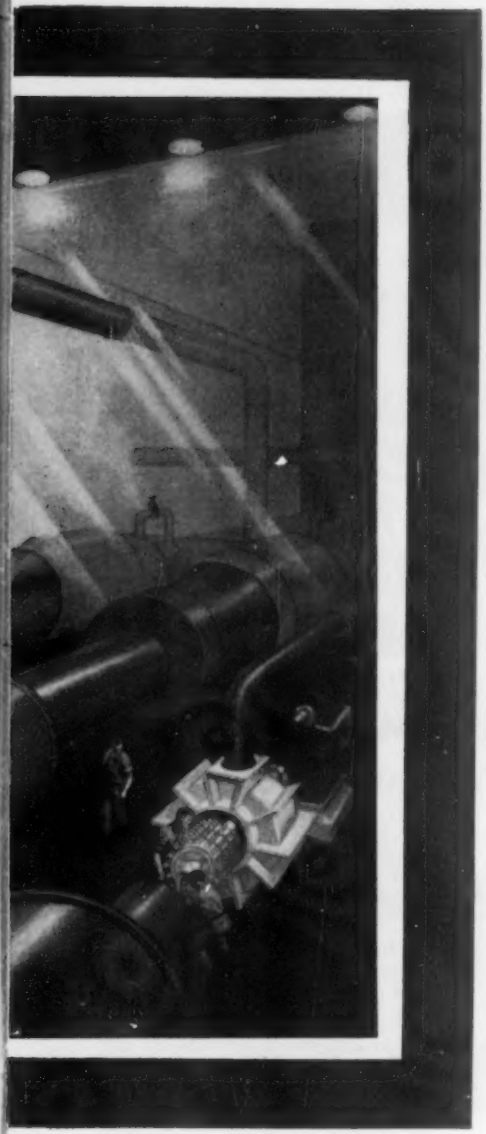
These motors weigh 1 lb. each and produce 32 lb. of thrust. In the Lake

VIEW OF LAKE DENMARK SITE shows some of RMI's test stands, liquid oxygen tank.

Advanced turbine



research laboratory



Power is basic to America's future in the air. Whether for small executive aircraft, short or long haul jet transports, fighters, trainers, missiles or other air weapons for free world defense . . . development of new powerplants sets the pace for progress.

Fairchild has taken the lead in the development of the small turbo-jet engine. An entirely new jet engine family has been created in its J44 . . . a package of power delivering higher thrust per pound weight.

Late this year, Fairchild Engine Division's new Turbine Research Lab will be completed and ready for action, armed with the newest engineering and manufacturing facilities and ready to serve America's best interests.

From its small beginning at Farmingdale, L. I. in 1928, Fairchild Engine Division's record has been one of constant growth and progress. This new facility, completely integrated for the latest powerplant manufacture, may be counted on in 1955 and the years to come to continue, as always, with *more power* with *less weight* in *smaller engines* to advance tomorrow's military and commercial aviation progress.

ENGINE AND AIRPLANE CORPORATION

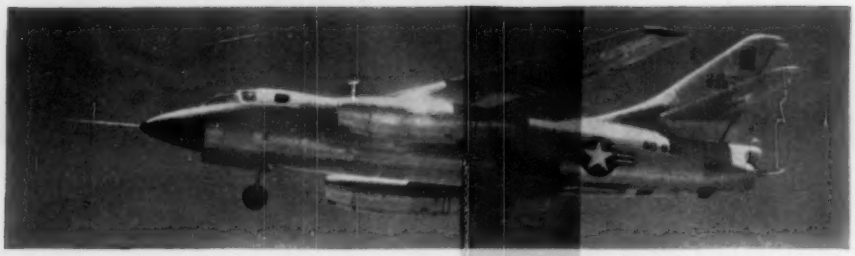
FAIRCHILD

*Engine Division**

DEER PARK, LONG ISLAND, NEW YORK

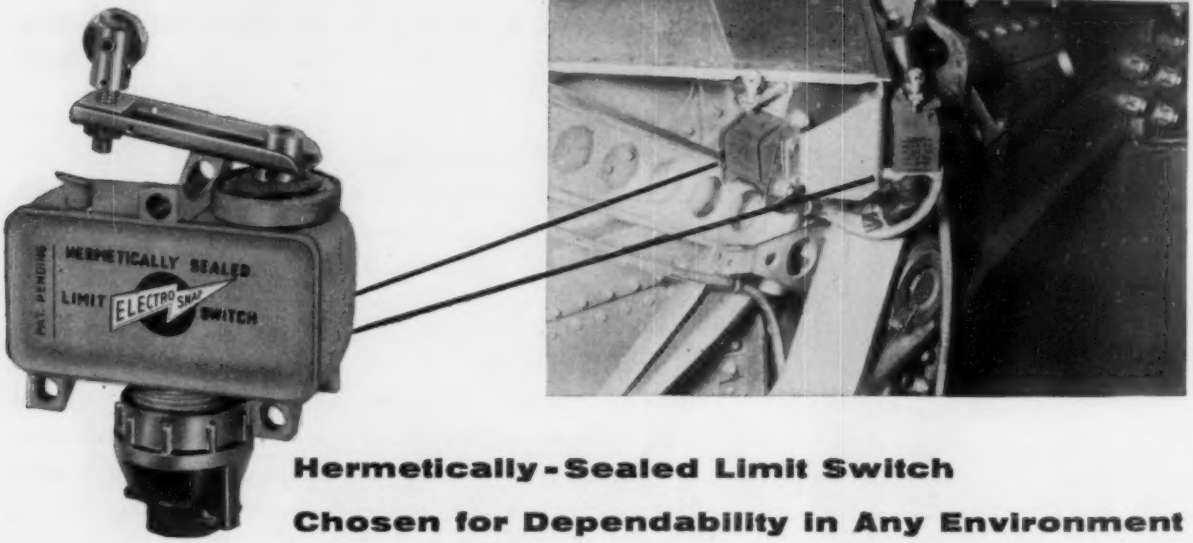
* Including AL-FIN, the Fairchild patented process for the molecular bonding of aluminum and magnesium to steel, cast iron, nickel or titanium.

"where the future is measured in light-years"



Two Electro - Snap Hermetically - Sealed Switches control latching on landing gear doors of the RB-66 Air Force-Douglas Bomber.

the DOOR LOCK INDICATOR SWITCH



Hermetically-Sealed Limit Switch Chosen for Dependability in Any Environment

In today's modern aircraft, remote "fingers" tell when closures are properly "buttoned up" for high speed flying. This Electro-Snap Door Lock Indicator Switch is a typical example. It controls landing gear door position, lights an indicator on the instrument panel when doors are securely latched, and "cuts out" the door motor.

To match the all-altitude, all-temperature performance of the aircraft it serves, the switch is hermetically-sealed. Both electrical and mechanical parts are sealed in a dry, inert gas for dependable operation *in any environment.* Temperature cycling can't cause condensation inside the case; the switch can't freeze because all moisture is sealed out. Hermetic sealing protects the switch from dirt, corrosive atmospheres, oil saturation, tampering and mis-adjustment.

Characteristics remain constant from —100° F. to + 250° F.* The unique tipping-action actuator operates dependably even when the outside case is coated with ice.

It's little wonder that Electro-Snap Hermetically-Sealed Limit Switches are first choice on so many modern aircraft—for all kinds of switching jobs where dependability is a "must". For complete details about the many types available, see our catalog in Sweet's and send us a description of your requirements.

**Higher temp. models also available*

ELECTRO-SNAP SWITCH AND MFG. CO.

4220 W. Lake St. • Chicago 24, Ill.

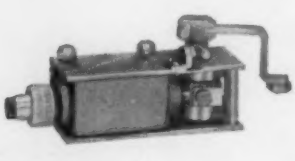
Write for Data sheet HM-10

Bomb Bay Switch
One of the many variations of the famous Electro-Snap Landing Gear Switch.

Flap Switch
When flap closes and depresses actuator, switch simultaneously operates four 10 amp, 30v DC circuits.

Rocket Switch
Now used in today's newest fighters for indicator and sequence circuits in rocket tubes.

Fuel Tank Transfer Switch
Extra-dependable four circuit hermetic switch for use in cockpit. Fits AN type toggle mounting.



Turret Switch
Rotary actuator gives long over - travel, flexibility in mounting. Extremely compact, lightweight case.

Denmark test area, RMI maintains two rotor test rigs—a lowspeed rig and a highspeed rig capable of turning at 1,000 rpm.

RMI Test Stands

In this area there are numerous stands capable of taking large and small rocket motors, as well as necessary storage facilities, including tanks for liquid oxygen, ammonia and alcohol. On a hill overlooking the test area is the 350,000-lb.-thrust stand on which the Viking engines were tested. RMI engineers say the stand could actually take 1-million-lb. units safely, but no motors of nearly that size have been tested here thus far. The largest to date has developed 120,000 lb., and about 75 runs have been made at 50,000 lb.

The company is working on application of rockets to liquid-propellant powered guns, jet drilling devices, catapults and launchers, seat ejectors and boundary layer control. The company is also investigating the possibility of manufacturing industrial chemicals as products of rocket combustion.

RMI's Future

Reaction Motors was founded in 1941 by four members of the American Rocket Society. James H. Wyld, one of the founders, produced the first design in this country for a fully regenerative rocket motor, basis of today's liquid propellant rockets. In this type of design, one propellant flows in a jacket surrounding the combustion chamber, thus cooling the chamber while it itself is warmed. The Germans developed the principle independently at about the same time as Wyld.

RMI'S present activities embrace both military prime contracts and industry subcontracts for specific types of piloted aircraft or guided missiles. The company is working on about 40 government contracts, Young told AVIATION WEEK.

A tour of the new facilities showed many inactive machine tools which indicated little production activity at present. However, company officials say RMI is headed for its biggest year yet. Orders for new business totaled over $9 million in 1954 and will go higher this year, with a backlog indicating continued growth in 1956. Present employment is over 600.

Plant Completed

The final piece of production equipment has been installed in the Timken Roller Bearing Co.'s laboratory-like plant in New Philadelphia, Ohio. Timken claims that the factory is the only one in the world devoted exclusively to the production of tapered roller bearings in substantial quantities which are held to tolerances of 75-millionth of an inch. Components of the bearings have to be accurate to 20-millionth of an inch to make up a bearing whose runout is accurate to 75-millionth.

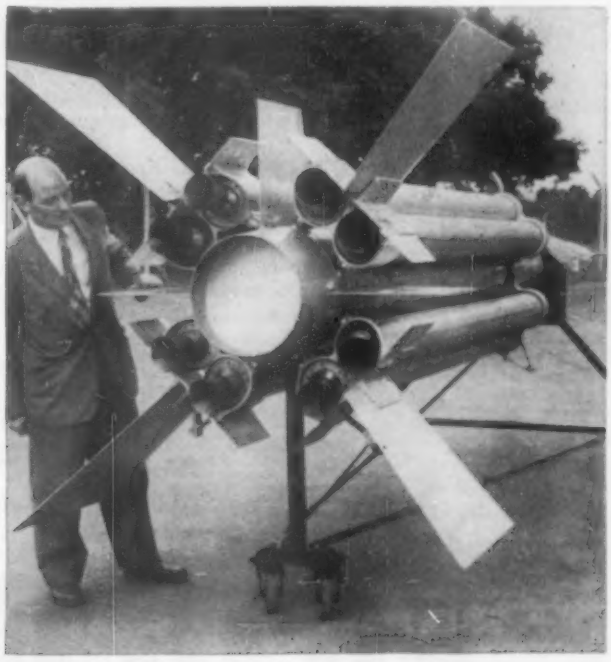
NAA Subcontracts Total $172 Million

North American Aviation, Inc., awarded subcontracts totaling more than $172 million during the first half of 1955 for the manufacture of parts and assemblies for the F-100 Super Sabre, F-86 Sabre, T-28B Navy trainer, FJ-3 and FJ-4 Fury.

The largest single contract, approximately $8 million, was given to Chance Vought Aircraft, Inc., for fabrication of the rear fuselage for the F-100. Other Super Sabre subcontractors include: Rheem Manufacturing Co., $6 million; Northrop Aircraft, Inc., two contracts totaling $3,400,000; Goodyear Aircraft Corp.; Seeger Refrigerator Co.; Servel, Inc.; Cleveland Pneumatic Tool Co.; Temco Aircraft; Liberty Products Corp.

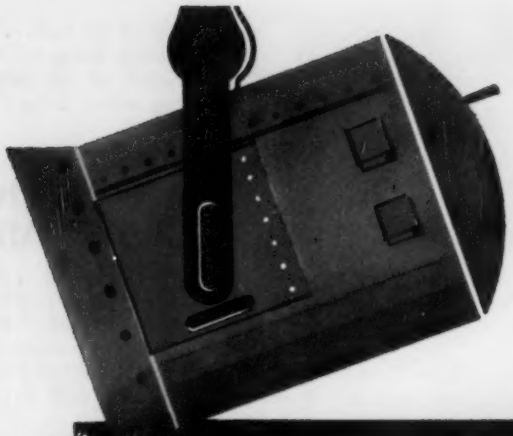
Contracts for components of the T-28B trainer, F-86, FJ-3 and FJ-4, included $3 million to Seeger Refrigerator Co.; $1,900,000 to Ryan Aeronautical.

More than 60 other companies were given contracts ranging from $100,000 to more than $500,000.



Britain's Napier Ramjet

Napier ramjet test vehicle is designed for low supersonic speed range and is boosted by a cluster of eight solid propellant rockets with offset thrust nozzles. Rockets are paired in structural unit, complete with fin; offset nozzles provide guaranteed separation just before burnout. Tiny air intake immediately ahead of boosters is ram air for air-turbine-driven fuel pump. Doppler (for velocity data) and telemetering (for performance data) antenna are visible in at least six locations. Note the unusual shape of vertical surfaces between boosters; the chord of the surfaces increases from root to tip.



BUCKET BRIGADE

Jet airpower is the backbone of America's defense, and jet engines depend upon scientifically exact turbine vanes, turbine blades and supercharger buckets for power and performance.

To mass-manufacture these vital precision parts, Austenal applies the ancient "lost wax" method of investment casting, greatly improved and now called Microcast—a technique so precise and so accurate that Austenal turbine buckets and vanes eliminate costly machining and require only a minimum of finishing.

The Microcast process was developed by Austenal, and its use in the manufacture of vital jet components is only one of many applications. In every field of industry, Microcast is proving that complex, intricate metallic parts can be made better and more economically by investment casting.

Let Austenal show you how Microcast can help brighten your production picture.

Write today for Austenal's informative booklet, "Design with Microcast in Mind".

® MICROCAST PRECISION CASTINGS PROCESS

austenal

LABORATORIES, INC.

microcast division

224 EAST 39th STREET · NEW YORK 16, N. Y.

PRODUCTION BRIEFING

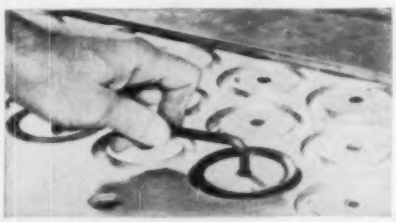
▶ **Associated Spring Corporation's** Bristol divisions, which suffered several hundred thousand dollars worth of damage from the floods which devastated large areas in Connecticut, reassured its customers that interruptions in deliveries would be minor. None of the divisions' processing equipment suffered major damage.

▶ **Torrington Co.** has moved its New York offices to the Port of New York Authority Bldg., 111 Eighth Avenue.

▶ **A new welding process** has been developed and patented by Trent Tube Co., E. Troy, Wisc., to manufacture welded stainless steel and high alloy tubing and pipe. The company inverts the rolls of the continuous mill and welded the formed tubing from the underside, permitting gravity to eliminate the weld bead on the inside diameter of the tubing. Even in the as-welded condition, the tube has a smooth and flawless interior surface, the firm reports. Trent Tube is now able to produce full-finished tubing and pipe sizes in the various Hastelloy grades, Zirconium, Zircoloy, titanium, and 19-9-DL.

▶ **Burgoyne X-Ray and Metal Testing Laboratory,** New Cassel, L. I., N. Y., is constructing a test cell capable of simulating altitude changes of a vertical ascent of more than 1,200 mph. with thermal changes of more than 50F. per minute for high-performance tests of rocket-powered missiles and flight components.

▶ **R. M. Hollingshead Corp.** has opened a new manufacturing and distribution center at Sunnyvale, Calif., as its Western Division headquarters. The plant is equipped to turn out maintenance chemical compounds at an annual rate of 1.5 million gallons.



OCTOPUS GRIP VACUUM CHUCK uses approximately 1,000 suction cups with removable rubber grommets to hold skin and pattern during milling operation. A screw in the center hole serves as a shut-off valve allowing any shape skin to be placed on chuck without complicated sealing-off of vacuum source. Developed by Convair and manufactured by Pioneer Tool Engineering, Inc., El Segundo, Calif.

Behind the PLEXIGLAS... *Proper Maintenance*

... Years of experience by the Rohm & Haas Company in manufacturing PLEXIGLAS acrylic plastic.

... Skill and know-how on the part of designers and fabricators of transparent enclosures.

These are the reasons the canopies, noses, astrodomes and windows on today's planes are notable for their clarity and strength, why they are dependable components of the country's aircraft.

Proper maintenance keeps them so.

The proper maintenance of transparent enclosures requires:

Use of approved cleaning methods and materials.
Protection of enclosures from paints and harmful solvents.

As the manufacturer of aviation's standard transparent plastic, we will be glad to supply detailed information on the care and maintenance of PLEXIGLAS. "Eyes of Flight," a 30-minute 16mm training film on this subject, produced for the armed services, is available from Rohm & Haas Company and CAA film libraries.

CHEMICALS FOR INDUSTRY

ROHM & HAAS COMPANY

WASHINGTON SQUARE, PHILADELPHIA 5, PA.

Representatives in principal foreign countries

PLEXIGLAS *is a trademark, Reg. U.S. Pat Off., and other principal countries of the Western Hemisphere.*

CANADIAN DISTRIBUTOR: *Crystal Glass & Plastics, Ltd., 130 Queen's Quay at Jarvis Street, Toronto, Ontario, Canada.*

The ancient priests of Egypt were engineers whose great pyramid of Cheops was sextant, compass and slide rule—all in one. From sighting the Pole Star, to squaring the compass, to the mathematics of pi—it's all there in the pyramid of Gizeh.

flying pyramids

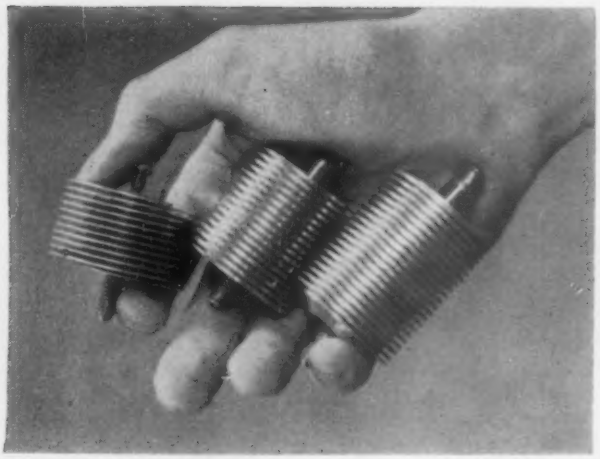
Wonder of the world for ages, Gizeh's pyramid was a fount of mathematical data—a tool to check measures, an aid to celestial navigation. Today's aircraft are "flying pyramids"—collecting and integrating instantaneous measurements for orientation and control. Kollsman activities cover these seven fields:

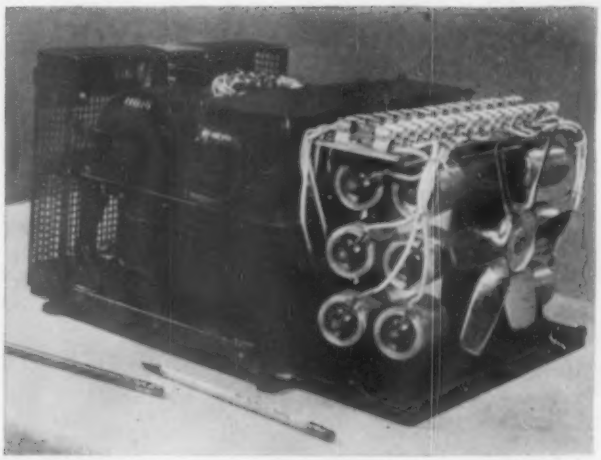
AIRCRAFT INSTRUMENTS
PRECISION CONTROLS
PRECISION COMPUTERS AND COMPONENTS
OPTICAL COMPONENTS AND SYSTEMS
RADIO COMMUNICATIONS AND NAVIGATION EQUIPMENT
MOTORS AND SYNCHROS
INSTRUMENTS FOR SIMULATED FLIGHT TRAINERS

Our manufacturing and research facilities . . . our skills and talents, are available to those seeking solutions to instrumentation and control problems.

kollsman INSTRUMENT CORPORATION

80-08 45th AVE., ELMHURST, N. Y. • GLENDALE, CALIF. • SUBSIDIARY OF *Standard* COIL PRODUCTS CO. INC.





SILICON RECTIFIERS (above) are key to new a.c. to d.c. converter. **POWER PACK** (above) uses magnetic amplifier to regulate output.

Silicon Rectifiers Lighten Power Pack

By Philip J. Klass

A new lightweight airborne a.c. to d.c. converter one-third lighter than—and requiring only one-half the space—of its predecessors, will be introduced this week by Westinghouse Electric Corp.

The new 200-amp. power pack converts engine-generated 200-v., 400-cycle power into 28-v. d.c., regulated to within one volt, and is capable of operating in ambient temperatures up to 120C.

The first public showing will be in Los Angeles at the exhibit of the Aircraft Electrical Society, a group which concerns itself with aircraft power generation and distribution systems. The exhibit is being held in conjunction with a technical conference sponsored by the Air Transportation Committee of the American Institute of Electrical Engineers.

Silicon Rectifiers

The new Westinghouse power pack, ATR-200A, owes its 55-lb. weight, high-temperature and close-regulation capabilities to the use of new high-power silicon rectifiers in combination with a two-stage magnetic amplifier voltage regulator.

This marks one of the first airborne applications of the high-power silicon rectifiers.

In addition to cutting weight and raising temperature limits, silicon rectifiers offer several other important advantages over the previously available selenium units. They include:

- **Long life** without deterioration of its various characteristics with age.
- **Greater efficiency,** cutting power losses and easing cooling needs.
- **Very low (reverse) leakage,** an important factor when used to bias mag amplifiers.
- **Hermetically sealed,** making them environment-resistant.

Power Pack Performance

Operating from engine-generated three-phase a.c. power, the new ATR-200A is designed to operate from an input of 200 volts ±5%, 400 cps. ±5%. Under this condition, Westinghouse says the unit provides:

- **Voltage regulation to within 1 volt.**
- **Recovery time of less than 0.2 sec.**
- **Ripple of less than 1 volt.**

The unit operates satisfactorily when input voltage or frequency vary as much as 10% from nominal, showing only slight degradation of regulation.

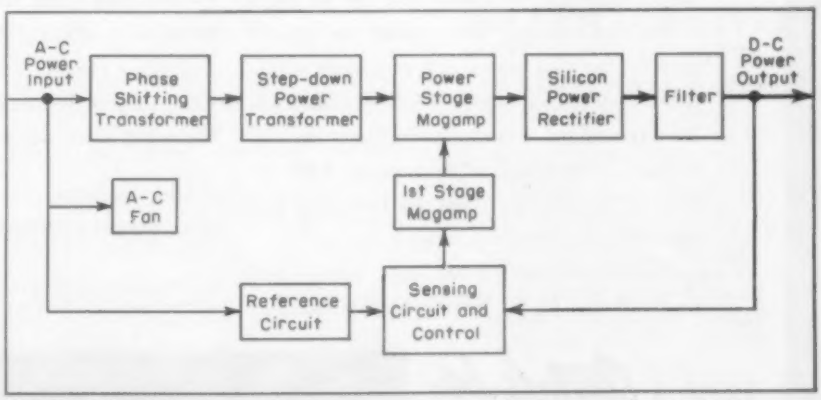
Voltage regulation is accomplished by a two-stage magnetic amplifier, which compares the output of the power pack with a 28-v. reference voltae obtained from a VR tube (see block diagram, below.)

The mag amplifiers are wound with silastic-covered wire impregnated with glass-epoxy resin and are designed for 1,000 hours life at ambient temperatures up to 120C, Westinghouse says.

Two or more of the Westinghouse units can be operated in parallel to supply a common load. Under these conditions, load will be divided equally among the several units to within ±5%, according to B. O. Austin, of the company's Aircraft Equipment Department, which developed the new unit.

Overload Characteristics

When input voltage is 200, and the frequency 400 cps., the overload characteristics of the single power pack



BLOCK DIAGRAM of new Westinghouse voltage-regulated a.c. to d.c. converter.

Cline Electric

HELPS OLD MOTHER HEN GATHER HER CHICKENS

North American FJ-4 Fury Jet

Toss a squadron of planes into the air from a floating carrier base — chase the planes around the vast ocean sky at speeds sometimes faster than sound. While her chickens have scrambled, put old mother hen herself, through violent tactical maneuvers. After an hour or two, bring them all back together again from hundreds of miles apart.

This is routine for the men, planes and ships of the U. S. Navy's "Hunter-Killer" groups. And Cline Electric, a leading manufacturer of shipboard and aircraft controls, and other electrical apparatus, is playing a vital role in helping make it all possible. We're proud of our assignment!

Private industry, too, can depend on Cline as a supplier of efficient electrical equipment.

CLINE ELECTRIC MANUFACTURING CO.
3405 West 47th St., Chicago 32, Illinois

Controls by

WIN YOUR WINGS IN THE U. S. NAVY!

BUILDING PRECISION INTO TARGET ZERO

match or exceed those of the d.c. generator it replaces, according to Austin. For example, the unit can withstand the following repeated overload cycles at rated input voltage and frequency for seven hours:

- **150% load for five minutes,** followed by 50% load for 10 minutes.
- **250% load for one minute,** followed by 50% load for 10 minutes.

Weight Saving

Making allowance for the increased alternator (a.c. generator) capacity required, plus associated cables and controls, the new 200-amp. power pack system weighs 63 lb. This compares with a figure of 93 lb. for previously available static power packs and 71 lb. for the equivalent d.c. generator (and accessories) it replaces. The new ATR-200A occupies a volume of 1,650 cu. in., about half the size of previous static power packs of comparable rating, which occupied about 3,000 cu. in.

Westinghouse is developing a line of both regulated and unregulated d.c. power packs, rated for 50, 100, and 200 amp. The weights of these units is as follows:

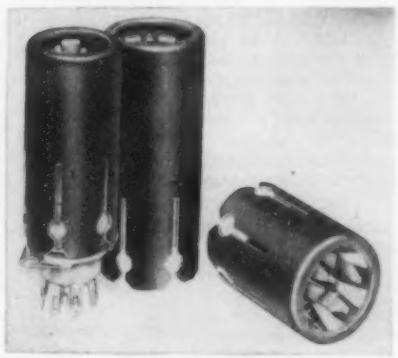
- **200 amp.:** 55 lb., regulated; 38 lb., unregulated.
- **100 amp.:** 36 lb., regulated; 17 lb., unregulated.
- **50 amp.:** 22 lb., regulated; 14 lb., unregulated.

All units are cooled by an a.c. motor-driven fan.

Tooling for Production

Although flight tests are not scheduled to begin until early 1956, the results of present environmental tests (altitude, temperature, humidity) lead Westinghouse officials to believe no major problems will turn up. As a result, the company is starting to tool up for production. Pilot quantities should be available by the end of the year, with large-scale production available early in 1956.

Full application data on the new power packs appears in Westinghouse Product Spec. No. 414744-Z, available from the company's Aircraft Equipment Dept., Lima, Ohio.



Tube Cooler

New heat-dissipating tube shield can be substituted directly for JAN-type shield without modification of existing equipment. Series TR is a modification of an earlier heat-dissipating shield which required a special base. New version reportedly drops bulb temperature as much as 50% under that achieved with JAN shields, and fits standard 7- and 9-pin miniature sockets. Manufacturer: International Electronic Research Corp., 177 West Magnolia Blvd., Burbank, Calif.

FILTER CENTER

▶**Go East, Young Man!**—West Coast avionics firms that play up climate to attract engineers are getting a dose of their own medicine from General Electric. A recent GE ad in a Los Angeles paper reads: "Come Back East. Join the trek back to the Mohawk Valley where there are four seasons of the year. Are you too hankering for the green hills of home?"

▶**Airline Power Conference**—Representatives of Eastern, National Northwest, Pan Am and United Air Lines attended a recent Westinghouse-sponsored two-day conference at Lima, Ohio, to acquaint themselves with a.c. power generation and distribution systems which may replace the long used 28-v. d.c. systems in new jet liners.

▶**New Fuel Warning Gage**—New version of Minneapolis-Honeywell's transistorized fuel gage for the Grumman F11F-1 has a built-in warning system to show whether the distribution of fuel between tanks is satisfactory. The M-H device monitors a separate system which normally shifts fuel between tanks to maintain proper aircraft CG location. The M-H system continuously compares amount of fuel in forward and aft tanks, and indicates whether fuel balance is "safe" or "unsafe," in addition to indicating total fuel in both tanks.

▶**A Lot of Printed Wiring**—General Electric expects to produce 1 million sq. ft. of printed wiring boards in 1956, representing a total of 5-6 million individual boards. This output will come from GE's newly acquired 100,000-sq. ft. plant in Auburn, N. Y., which a spokesman calls "probably the world's most completely mechanized printed wiring board production line."

Reliability Report—Aeronautical Radio, Inc.'s "General Report No. 1, Investigation of Electron Tube Reliability in Military Applications" (AW Apr. 5, 19, 1954), has been placed on the Defense Department's "Selected List of

Next time the missus asks if you've paid your life insurance, tell her you've switched to a **LEAR ARCON** so you can both enjoy the money.

NEVER fly in instrument weather without an instrument rating!

SAFER! UNITED ADJUSTABLE MAINTENANCE STAND

Provides a 3′ by 6½′ safety steel platform with guard rails at exactly the right height for maximum efficiency. Plenty of room for tools and freedom of movement. Easily positioned by one man, hydraulic lift operates like an elevator. Attachments available for motorized towing. Capacity 500 lbs. Model D4 service range 3′ to 7′. Model D5 service range 7′ to 12′.

THOUSANDS IN USE TODAY THROUGHOUT THE WORLD

Write for prices

UNITED STEEL & WIRE CO.
BATTLE CREEK, MICHIGAN

Take Euclid's Advice

He said, "The shortest distance between two points is a straight line."

Apply this axiom to your professional career and it means: to get there you've got to keep moving straight ahead.

You can do just that at TEMCO. No blind alleys—no snafus! TEMCO is young, dynamic, growing fast. There's plenty of room at the top for the talented, ambitious engineer. You don't have to wait to see your ideas produced in hardware; you enjoy the satisfaction of real achievement now.

Measure your accomplishments against your ambition—if they don't balance, maybe you belong at TEMCO.

OPENINGS NOW FOR DESIGNERS IN:

Structures	**Power plant**
Controls	**Hydraulics**

Write: Bud Horton,
Engineering Personnel,
TEMCO Aircraft Corp.,
P. O. Box 6191, Dallas 2, Texas

TEMCO
AIRCRAFT CORPORATION
DALLAS, TEXAS

Important Reliability Publications." The list is prepared by Defense's Advisory Group on Reliability of Electronic Equipment (AGREE). A few copies of the Arinc General Report No. 1 still are available at 50 cents per copy. Arinc's address: 1520 New Hampshire Ave., N.W., Washington, D. C.

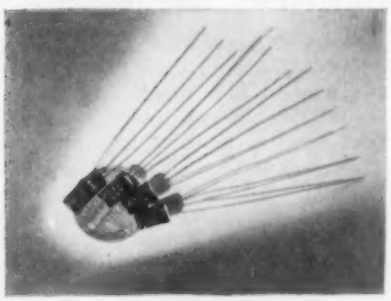
▶**New Computer for Air Arm**—A new IBM 650 magnetic drum data processing machine has gone into use at Westinghouse Electric's Air Arm division in Baltimore for fire control studies.

▶**Management Key to Survival**—"Survival in the mushrooming electronics industry during the next 10 years will depend upon mastery of business fundamentals rather than technical achievement." This is the view of Philip S. Fogg, president of Consolidated Engineering Corp. "The life blood of the electronics industry must continue to flow from the research lab," Fogg said, "but leadership and even survival . . . will be based upon management achievement in the non-technical aspects of the business." Fogg said the electronics industry grossed $8.8 billion last year.

NEW AVIONIC PRODUCTS

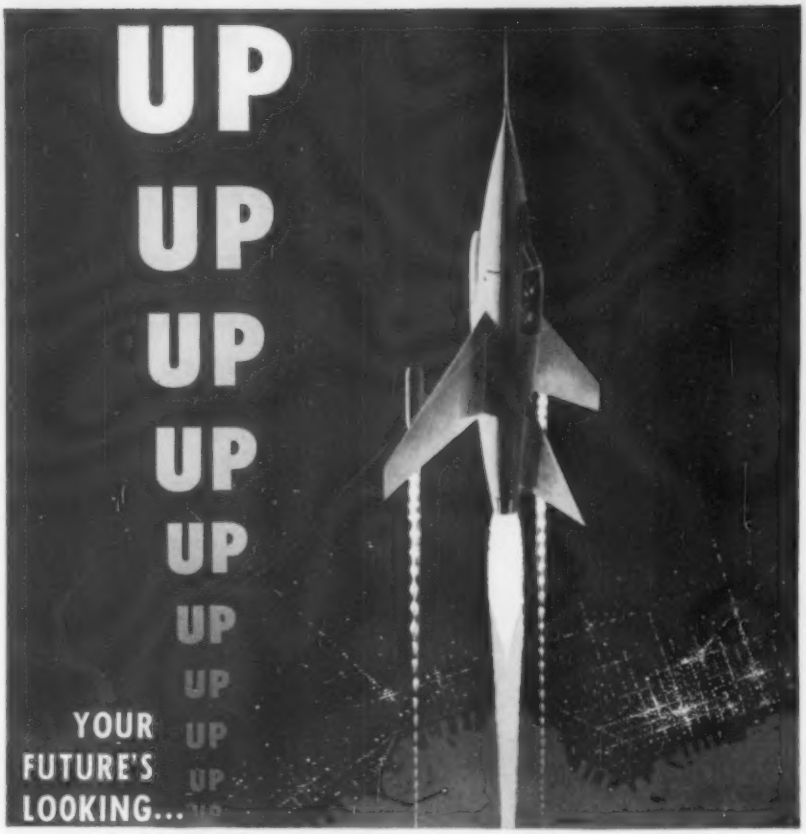
Components & Devices

● **Miniature transistors,** one-quarter to one-third the size of former units, are now available in four new types. Units all are P-N-P fused-junction germanium types and come in cases measuring only 0.31x0.20x0.14 in. Types 2N130,



2N131, and 2N132 are for use in audio or low-frequency applications; the 2N133 is a low-noise transistor for use in low-level audio circuits. Maximum ambient temperature is 85C. Application data is available from **Technical Information Service, Raytheon Mfg. Co., 55 Chapel St., Newton 58, Mass.**

● Miniature hermetically sealed aluminum electrolytic capacitors, Type 30D, for transistor circuitry, called "the smallest ever made," are available in wide range of capacitances from 1 to



. . . when you apply for an engineering job at Marquardt, one of the leaders in the field of supersonic jet propulsion. Set your sights sky-high! At Marquardt, you'll be a creative part of the team that is accomplishing Speeds . . . Altitudes . . . Acceleration . . . never before dreamed of! Look up . . . with Marquardt!

For information regarding employment, write:

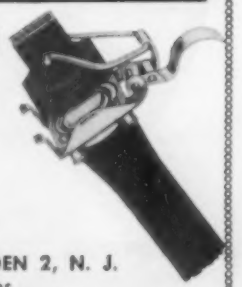
marquardt AIRCRAFT CO.

INDUSTRIAL RELATIONS DEPARTMENT
ATTENTION: PROFESSIONAL PERSONNEL
16551 SATICOY STREET • VAN NUYS, CALIFORNIA

THE WEST'S LARGEST JET ENGINE RESEARCH AND DEVELOPMENT CENTER

PREVENT DAMAGE TO RADAR RT UNITS AND WAVEGUIDE ASSEMBLIES

Airtron QUICK DISCONNECTS!



eliminates thread wear • ideal for tight quarters
no tools needed • connects in seconds •
compact, maintains air pressure • corrosion-resistant
shock and vibration proof

Available for military type square or round flanges.
Write Dept. S for complete information.

Airtron INC. 1095 W. ELIZABETH AVE., LINDEN 2, N. J.
Offices in principal cities

There's more PULL
built in
Sensenich Propellers
New
FIXED PITCH METAL
CAA approved up to 165 hp.
FIXED PITCH WOOD
CAA approved up to 225 hp.
TEST CLUBS
up to 3000 hp.
Get all the facts...
write for Bulletins and Price Lists.
Dept. W, Sensenich Corp., Lancaster, Pa.
Sensenich PROP SHOP... Certified Repair Station for all makes fixed pitch metal or wood propellers ... Sensenich, Beech and Hartzell controllables. Magnaflux, etching, anodizing and plating service available. Service Hangar on Lancaster Municipal Airport. Approved Propeller Repair Station 3528. Unlimited Class 1 and 2 ratings.
AIRCRAFT
SENSENICH
PROPELLERS
Serving the Aircraft Industry
for a Quarter of a Century

PROBE and DROGUE
Refueling gives RANGE UNLIMITED
to the McDONNELL F2H BANSHEE
NH
NAVY
XC
McDonnell F2H Banshee refueling from NORTH AMERICAN AJ, carrier-based tanker. Both equipped with Flight Refueling Inc. Probe and Drogue system.
Simplest, most efficient in-flight refueling system
PIONEERED AND DEVELOPED BY
Flight Refueling, Inc.
IN USE WITH U.S. NAVY AND USAF
FRIENDSHIP INTERNATIONAL AIRPORT
BALTIMORE 3, MARYLAND

110μfd, and in standard working voltages of 1, 3, 6, 10, 12 and 15 v. Maximum operating temperature is 65C, limiting their use in airborne equipment. Engineering Bulletin 320 gives application details. **Sprague Electric Co., Technical Literature Section, 327 Marshall St., North Adams, Mass.**

Miniature d.c. servo motor, Cat. 5BBY13DJ7, designed for airborne use, is available with differentially-wound or straight shunt field. Motor is rated at 0.002 hp. at 6,500 rpm., and draws 0.8 amp. from a 28-v. d.c. supply. Motor can be geared to provide output speeds as low as 130 rpm. **General Electric Co., Specialty Component Motor Dept., Ft. Wayne, Ind.**

Rate gyroscopes, with 100% flotation in silicone fluid, are available in a new line which offers choice of angular momentum up to 10^6 gm. $cm.^2/sec.$ Driving motors can be d.c., a.c. hysteresis or governed induction type. Maximum size is $2\frac{1}{4}$ in. dia. x $4\frac{1}{2}$ in. long. Choice of damping systems is offered. **Gyromechanisms, Inc., Halesite, N. Y.**

Constant-speed alternator drive for 20-kva. machine weighs only 39 lb., approximately 20 lb. lighter than other constant-speed drives of the same rating, according to manufacturer. Unit maintains constant output speed of 8,000 rpm. for input speeds of 3,900 to 8,300 rpm., and has a continuous rating of 32 hp., with a higher short-interval rating. Speed control is maintained within 1%, or better if required. **General Electric Co., Aeronautic & Ordnance Systems Div., Schenectady, N. Y.**

Laboratory Equipment

Audio frequency wave analyzer, Type FT-FNA, includes analyzer, and two-axis recorder for automatic or manual analysis of vibration and noise levels. Unit offers a choice of logarithmic or linear scale and has a 5-inch wide chart. Sensitivity is adjustable between 1 microvolt and 100 volts. Device also offers choice of narrow (10 cps) or wide-band (200 cps) selectivity. **Federal Telephone & Radio Co., Instrument Div., 100 Kingsland Road, Clifton, N. J.**

High-voltage power supply, delivers 100 to 5,00 v.d.c., with 8 ma. at 5,000 v. Regulation is $\frac{1}{2}$% or better, no load to full load, and with line variation of 105 to 130 volts. Response time is quoted at 5 milliseconds from 1 kv. to 5 kv., with ripple at 0.05% and stability at 0.25%. Multi-turn pot permits extra-fine degree of control on setting output voltage. **Neutronic Associates, 87-16 116th St., Richmond Hill 18, N. Y.**

From Comox to Zweibrücken . . . and beyond

Orenda Power . . . and Orenda Service

Wherever Orenda engines go—driving the Sabre 5's and 6's on their NATO mission in Europe or the CF-100 all-weather interceptors of the RCAF patrolling our Far Northern frontiers—there goes Orenda Service . . . Technical service support of the highest calibre.

Orenda service teams today are stationed in the far Canadian north . . . in semi-tropical Africa . . . on RCAF air bases in Europe . . . in England . . . and soon will be in South Africa to assist in maintaining the Orenda-powered Sabre 6's recently ordered by the South African Air Force.

Trained at Orenda's Malton headquarters, and recalled regularly for refresher courses, the skilled engineers, technicians and mechanics who make up Orenda's field service team are key links in the complex organization charged with the defence of the free world today and for the future.

ORENDA

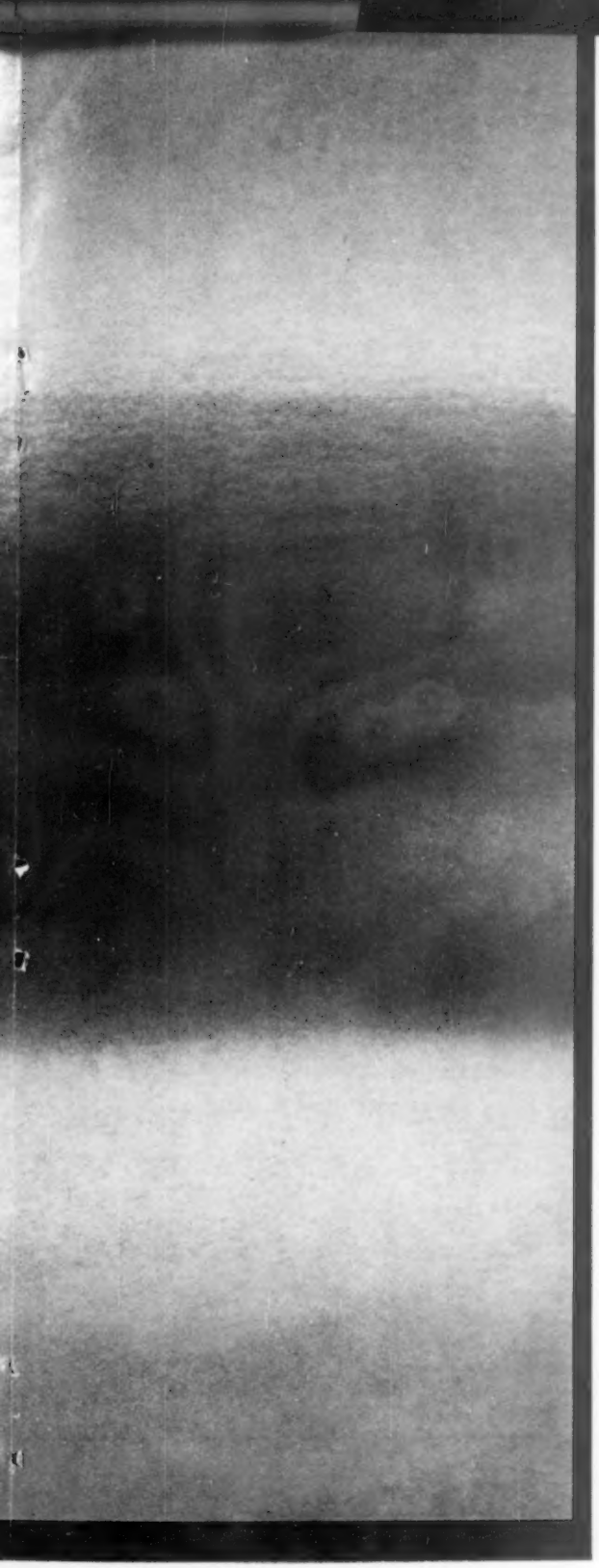
ENGINES LIMITED, **MALTON, CANADA**

MEMBER, A. V. ROE CANADA LIMITED & THE HAWKER SIDDELEY GROUP

Giusti

ENGINEERS WANTED:
For top-flight men, Lycoming offers unusual opportunities to explore new scientific frontiers that lead to outstanding and rewarding careers. Write to Vice President, Industrial Relations, Stratford, Conn.

Lycoming



Lycoming harnesses the hot breath of a new era

Now, in the lungs of Lycoming's advanced gas turbines developed for the Military—the turbine principle finds new usefulness, this time for helicopters. Employing broad knowledge and bold thinking in aerodynamics, thermodynamics, and metallurgy, scientists of Avco's Lycoming Division have achieved in the T 53 turbine important design advantages: dramatic compactness (never before has 800 H. P. been housed in so little space), versatility in installation and operating characteristics, high efficiency, ruggedness, long life, and low production cost. The T 53, developed in close cooperation with the U. S. Air Force and U. S. Army Transportation Corps for helicopter use, also broadens the benefits of turbine power to fixed wing aircraft and many other mobile and stationary applications. Through advanced turbines—as well as improved reciprocating engines, better components, finer precision parts —Lycoming translates research into practical realities for defense, for peace.

The turbine era is here. A broad variety of future non-military applications of gas turbines awaits the ingenuity of industry. If your plans are in any way linked to power—turbine or reciprocating—now is the time to look to Lycoming! Write on your letterhead to Lycoming, Stratford, Conn. Ask for T-53 booklet.

FOR A COPY OF THIS GUISTI ILLUSTRATION, SUITABLE FOR FRAMING, WRITE TO PUBLIC RELATIONS DEPT., LYCOMING, STRATFORD, CONN.

POWER PLANTS
ELECTRONICS
AIR-FRAME COMPONENTS
PRECISION PARTS

avco MANUFACTURING CORPORATION DEFENSE AND INDUSTRIAL PRODUCTS

Designed, developed, and produced by

Lycoming ▼ avco advanced development **▼ Crosley**

BOSTON, MASS. • CINCINNATI, OHIO • DAYTON, OHIO • EVERETT, MASS. • LOS ANGELES, CALIF. • NASHVILLE, TENN. • STRATFORD, CONN. • WASHINGTON, D. C. • WILLIAMSPORT, PA.

TODAY'S MILITARY SERVICES, WITH THEIR TREMENDOUS TECHNOLOGICAL ADVANCES MADE POSSIBLE THROUGH SCIENCE, OFFER A VITAL REWARDING CAREER

MICRO SWITCH Precision Switches
A PRINCIPLE OF GOOD DESIGN

Here's a NEW concept in airborne switches—

Small . . . completely sealed . . . cylindrical switch for landing gears, flaps and other exposed locations

• This MICRO SWITCH "**EN**" Switch has greater versatility than switches many times its size and weight.

It is one of a new family of MICRO SWITCH environment-proof switches which offers aircraft designers unusual flexibility in switches whose elements are completely sealed from effects of atmospheric changes.

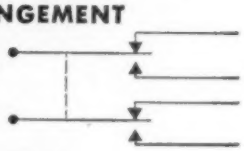
The "**1EN1-6**" shown here is composed of two single-pole, double-throw switching units completely sealed in a housing filled with inert gas under pressure. Six 20-gauge **MIL-W-5086** leads, six feet long, are supplied, one from each terminal. These project at a 90-degree angle from the base of the switch. They may be run in any direction by rotating the switch.

These switches are designed for bracket type or through-hole mounting. The plunger operates through a ⅜ x 24 threaded bushing one inch in length.

For complete information on the new "**EN**" switches, types of rotary actuators and circuitry developments, contact MICRO SWITCH Engineering Service at your nearest branch office. Let them show you the complete MICRO SWITCH line of environment-proof and hermetically sealed switches for severe airborne service. You will find that it pays to bring your switch problem to MICRO SWITCH first.

CIRCUIT ARRANGEMENT

• Circuit is double-pole, double-throw. The wiring diagram and terminal designation are shown on the side of the switch.



ELECTRICAL RATING
(at 30 volts d-c)

INRUSH
Normally-closed, 24 amperes
Normally-open, 24 amperes

AT SEA LEVEL
Resistive, 4 amperes
Inductive, 3 amperes
Motor, 4 amperes

AT 100,000 FEET
Resistive, 4 amperes
Inductive, 2 amperes
Motor, 4 amperes

A complete line of snap-action switches for aircraft

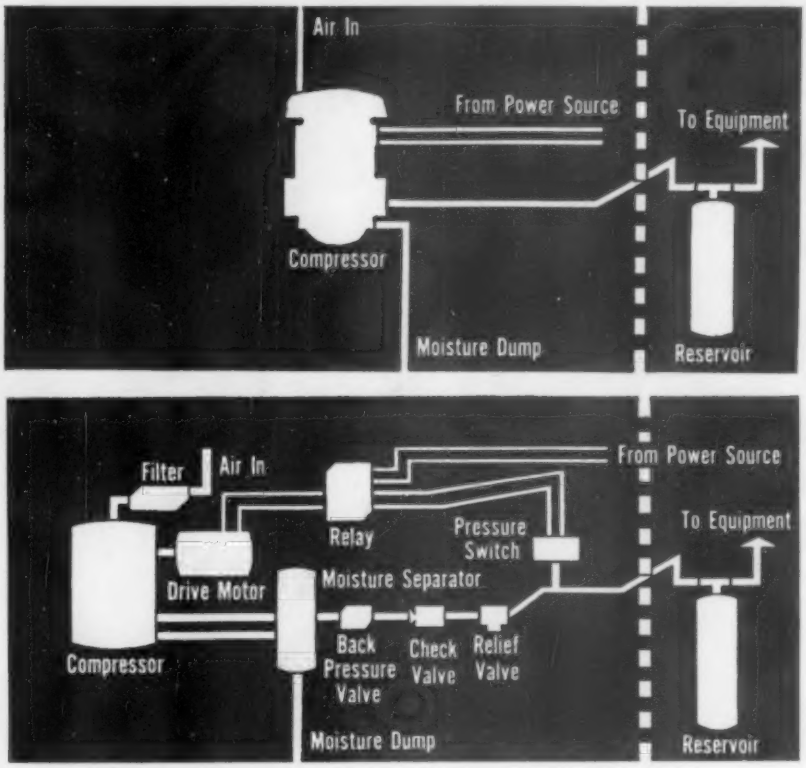
MICRO SWITCH provides a complete line of extremely reliable, small-size, high-capacity, snap-action precision switches and mercury switches. Available in a wide variety of sizes, shapes, weights, actuators and electrical characteristics. For all types of electrical controls.

MICRO SWITCH

A DIVISION OF MINNEAPOLIS-HONEYWELL REGULATOR COMPANY

In Canada, Leaside, Toronto 17, Ontario • **FREEPORT, ILLINOIS**

H HONEYWELL



COMPACTNESS of new pneumatic package (top) as opposed to regular system (at bottom).

Pneumatics Fade, Hydraulics Gain As Supersonic Power Sources

By George L. Christian

Minneapolis—The days of high-pressure pneumatics as the power source for ancillary systems in supersonic jet aircraft appear to be limited.

More and more, designers are turning to hydraulics.

The change has been recognized—and admitted—by R. T. Cornelius, president of the Cornelius Co., one of the nation's first suppliers of aircraft pneumatic systems. And he has only to point to the century-series of fighters to back up his admission.

The once-vital high-pressure pneumatic systems have been omitted entirely in all the currently-built century-series—the F-100, F-101, F-102, F-104 and F-105—as well as in the F8U Navy fighter and the B-58 bomber. Even the B-52 has only a small high-pressure system to supply compressed air for rear turret gun charging and radome pressurization.

Design of hydraulic pumps, motors and other components has advanced to the point where Cornelius engineers can make hydraulic systems competitive with pneumatic systems from a weight and space standpoint. This, in turn, makes it practical to take advantage of the hydraulic system's ability to supply energy continuously (the pneumatic system delivers air only intermittently, because air is normally used faster than pumps can compress it).

Exit Pneumatics

Also, the switch to rockets in fighter aircraft is eliminating the need for gun charging, usually done pneumatically. Rocket launching is best accomplished electrically.

The complete B-52 accessory system is driven by a pneumatic system, but the pressure is low. Air is bled from the ship's eight turbojet engines. It operates air-driven "power packs" which produce all electrical and hydraulic power, runs the air conditioning systems and water injection pumps of the big bomber.

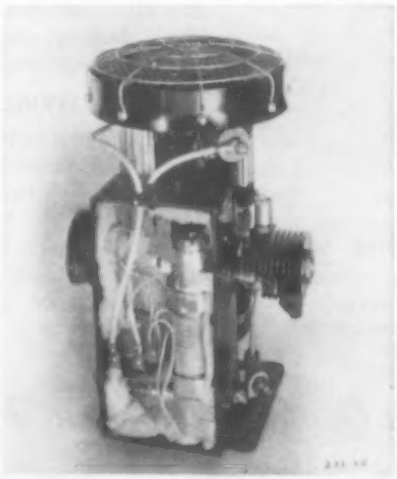
Cornelius, however, has not stood still on pneumatic design. Cornelius-developed 3,000-psi. "packaged" pneumatic systems of reduced weight and size are going into several jet fighters and some older piston-powered planes.

Too Many Drive Pads

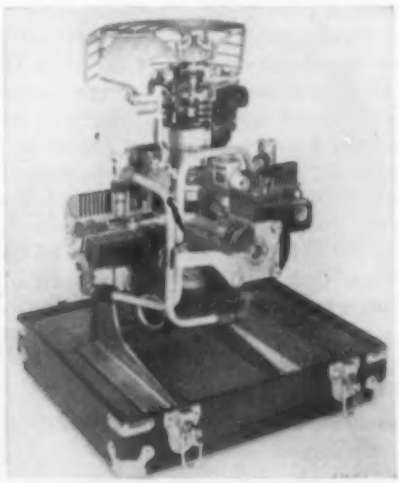
By using hydraulics, Cornelius believes it will be possible to reduce the number of accessories, which now clutter turbojet engines, to only two. Both would be hydraulic pumps, one for power flight controls, and the other to drive all accessories through hydraulic pump/motors.

This would cure one of the headaches troubling jet engine manufacturers—where and how to provide enough drive pads to accommodate the many accessories needed to supply the growing power demands of electrical, hydraulic and pneumatic systems (AW May 9, p. 63).

Cornelius told AVIATION WEEK his firm has been working for over a year on



NEW pneumatic package designed by Cornelius.



HYDRAULIC compressor used on FJ2-3, F7U-3.

G-E EXPLOSION-PROOF MOTOR FOR AUTOMATIC PILOT SYSTEM is rated 1/10 hp, 7500 rpm, 27.5 volts d-c. Duty cycle: continuous at 20% load with additional 80% load applied 15 seconds on, 15 seconds off. Emergency duty cycle: 20 minutes continuous full load after motor operating temperature has been stabilized at normal duty cycle.

G-E aircraft motor specialists help solve drive problem on new Collins automatic pilot

E. H. Fritze, Controls Engineer, Collins Radio Co. (pictured above) says: "In the development of a new automatic pilot system, we were faced with an electric-drive problem. When two other suppliers failed to meet our requirements, we called in General Electric.

"In conferences between our engineers and G-E aircraft-motor specialists brought in by our local G-E Sales Engineer, we arrived at a solution to our problem. Sample motors were delivered in three weeks, saving us considerable engineering time and expense. We find service like this very valuable," Mr. Fritze concludes.

EXTENSIVE TESTING BACKS SERVICE

When G.E. develops a new aircraft or armament motor, extensive environmental testing facilities are called into play. For example, the G-E motor for Collins was subjected to, and passed an insulation test, vibration test, shock test, and an accelerated life test. Such testing assures conformance with your most exacting requirements.

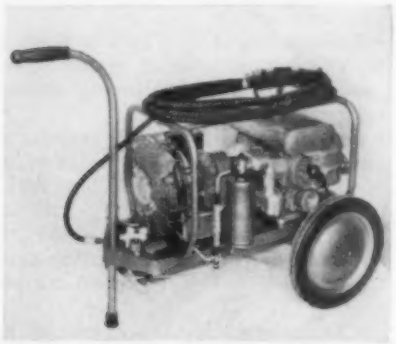
G-E SERVICE FOR YOUR DEVELOPMENT

If you have a development that calls for an aircraft or armament motor, the same fast, effective service provided the Collins Radio Company can be yours from General Electric. Just contact your local G-E Apparatus Sales Office early in your planning. Or write giving full details to Section 704–57, General Electric Company, Schenectady, N. Y.

Progress Is Our Most Important Product

GENERAL ELECTRIC

SMALL (5 in. long) Cornelius hydraulic motor operates at 96% efficiency.



SPECIAL portable compressor designed for R.C.A.F. to service landing-gear struts.

a series of hydraulic pumps that are less than half the weight of equivalent capacity pumps now on the market. These pumps are now running at an efficiency of 96%, but refinements now underway are expected to increase this figure.

First in the series is a pump which has a displacement of 1 cu. in./rev. The unit, now on test, develops 25 hp. and delivers 6 gpm. at 1,500 rpm. The fixed-displacement version of this new pump weighs 4 lb., the variable-displacement copy a 6 lb.—much less than half the 16 lb. of a pump of comparable displacement currently on the market.

The series of pumps Cornelius has under development ranges in size from 1/16 to 4 cu. in./rev. The company says the price of the lightweight pumps will be competitive with others on the market.

Custom-Built Seals

Cornelius credits the high efficiencies of its hydraulic equipment to the fact that the company designs and builds all of its own bearings and shaft seals. Since both types of components are designed for specific applications instead of coming off-the-shelf, they are the smallest, lightest, strongest units which can do the job.

One company-developed seal, which has been on test for 2,500 hr., has yet to develop a leak. (Leakage is defined as any evidence of bubbles during a submersion test).

Another design refinement which permits the company to extract the utmost in efficiency from the pump includes a special, very small universal joint to drive the cylinder block. Novel design of the joint permits the cylinder block to be considerably smaller in diameter than before.

The block itself is made of hardened steel, which allows use of much thinner walls than if the block were made of a softer metal such as brass. Small cylinder block circumference allows cylinder ports to be extra large, leading to high pump efficiency. Also, cylinder bores are finished to two micro-inches.

High pump efficiency provides a heat bonus to airframe hydraulic system engineers. The lower a pump's efficiency, the more heat it rejects into the hydraulic system; the more efficient it is, the more desirable it is for today's literally "hot" airplanes.

A new Cornelius design concept for hydraulic motors incorporates a method of continuously lubricating the pump's

Pro-Seal Potting Compounds and Sealants Protect North American's F-100C Super Sabre!

Tremendous stress, vibration, moisture and heat give no respite in this world speed record holding jet... leave no room for failure *anywhere*... at *anytime*.

Good reason for your company also to adopt Coast Pro-Seal No. 727, Potting Compound. It meets or exceeds all military and industrial specifications where flexibility is a requirement.

7 Reasons Why Coast Pro-Seal Is Superior:

1. Extremely dense cured material... prevents leakage, minimizes rejects.
2. Remains highly flexible at a wide temperature range.
3. With higher solid content, more economical.
4. Exceedingly low shrinkage because of higher solid content (97%).
5. Outstanding moisture resistance.
6. Viscosity that allows free pouring.
7. Product stability.

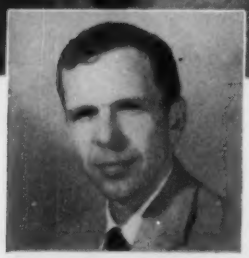
Pro-Seal

COAST PRO-SEAL & MFG. CO.

2235 Beverly Blvd., Los Angeles 57, Calif.

Pioneer and leader in the development and production of aircraft sealants, adhesives and coatings. Your research problem is our problem. Contact our office in your area for data and engineering help.

Offices: Los Angeles, Seattle, Dayton, Philadelphia, Atlanta, Wichita, Kansas City, Ft. Worth.



"The new Piasecki giant transport helicopter has been an exciting assignment."

says: Ken Waters, Senior Structural Test Engineer.

"Working on Piasecki projects like the H-16 has been challenging and rewarding. This, together with good employee benefits and the fact that the plant is located in suburban Philadelphia, where family living conditions are ideal, has made Piasecki the company for me."

ENGINEERS, excellent opportunities are open today, just as they were for Ken Waters when he joined Piasecki in 1950 as Junior Engineer from Ohio State. Here is your opportunity to team up with men who are engineering a new era in air transportation, to join a firm internationally recognized as a leader in the field. The future for large helicopters is unlimited, so too is *your* future at Piasecki.

Investigate the following job categories. There may be a place for you in this fast growing organization.

DESIGN • POWER PLANT INSTALLATION • AERODYNAMICS • INSTRUMENTATION • TESTING (FLIGHT AND STRUCTURE) • EQUIPMENT VIBRATION • STRESS ANALYSIS • TRANSMISSIONS • AIRFRAMES

Send your resume today to John Tannone, Jr. Employment Representative

FIRST IN TANDEM TRANSPORT HELICOPTERS

Piasecki

HELICOPTER CORPORATION
MORTON, PENNSYLVANIA

valve plate. Result is a unit which delivers high starting torque.

First models have produced starting torques of up to 90% of running torque. Development of the design will lead to pumps with starting torques comparable to those of electric motors —about 200-300%—Cornelius predicts. Weight penalty for this feature will be about 50%.

Packaged Pneumatics

The Cornelius packaged pneumatic system wraps into a single unit containing the compressor, inlet air filter, starting relay, radio noise filter, moisture separator with automatic condensation dump and heating element, back pressure valve, check valve, relief valve and pressure switch. Its advantages:

- **Saves space.** The entire air supply system takes only a little more room than the compressor alone in a conventional pneumatic system.
- **Reduces weight.** Up to 5 lb. is saved by eliminating separate system components plus associated tubing, fittings and connections.
- **Cuts leakage.** Integrated system reduces to a minimum the number of potential leakage sources, such as flared connections and O-ring seals.
- **Saves time.** Unit can be removed and replaced as a package, eliminating need for replacing several individual components.

The packaged system is powered by a Model 130 compressor rated at 2 cfm., 3,000 psi. Among planes using the system: Grumman F11F-1, Chance Vought F7U-3, North American FJ-2, -3, -4, McDonnell F2H-3 and F3H, Lockheed P2V, Grumman S2F, Martin P5M.

The systems are available with a.c., d.c. or hydraulic motor drives.

New Compressors

Cornelius has two new air compressors under development. First is a 4-cfm., 3,000-psi. unit, which will be approximately the same size and slightly lighter than the present 2-cfm. Model 130.

Space and weight savings will be due largely to the new lightweight hydraulic motor which will drive the compressor.

The other new unit will be an 8-cfm., 3,000-psi. air pump whose weight and size have not yet been fully determined.

Another development which the company has completed and delivered to Wright Field is a modification of two Model 130 compressors to deliver 5,000 psi. at 1.5 cfm.

The Cornelius compressors have low starting friction (they use ball and needle bearings throughout) and rings on all pistons have been eliminated. The high starting torque of the motor

OUTSTANDING LOAD CAPACITY

EXCEPTIONAL RELIABILITY

Collins MAGNETIC COMPASS SYSTEM

Combining the high sensitivity of a modern earth inductor with reliable magnetic amplifiers, Collins engineers have developed the MC-101 system which produces highly accurate heading information. Flight panel simplification is achieved by presenting Heading on an azimuth ring or RMI card. The Remote Master Heading Indicator is included on the Compass Amplifier. By use of a single control the pilot can select automatic or D/G functions, and can manually correct the D/G left or right.

No additional amplifiers are needed. Three transmitters in addition to the D/G transmitter provide more than adequate system output as well as electrical isolation between various heading loads. It can be used with a/c navigational units, like the 51R-3, OBS and OBI instruments, and systems such as Collins IFS and Automatic Pilot. Modular construction, with the advantages of plug-in subassemblies, provides the utmost in flexibility and servicing convenience.

Write for MC-101 brochure or contact the Collins Dealer or Sales Office nearest you.

COLLINS RADIO COMPANY

855 35th Street N.E., CEDAR RAPIDS, IOWA
1930 Hi-Line Drive, DALLAS 2, TEXAS
2700 W. Olive Avenue, BURBANK, CALIFORNIA
261 Madison Avenue, NEW YORK 16, NEW YORK
1200 18th Street N.W., WASHINGTON, D.C.

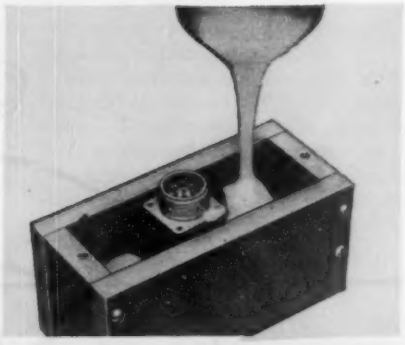
COLLINS RADIO CO. OF CANADA, LTD.
77 Metcalfe Street, OTTAWA, ONTARIO

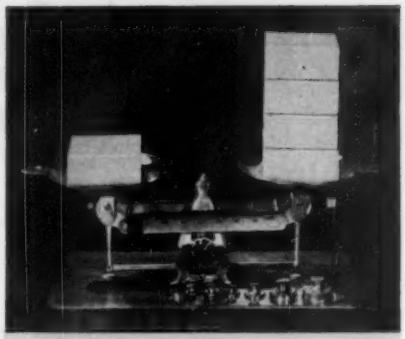
COLLINS RADIO CO. OF ENGLAND, LTD.
Sunflex Works, Golham Mill Road
West Drayton, MIDDLESEX, ENGLAND

NOPCO® LOCKFOAM

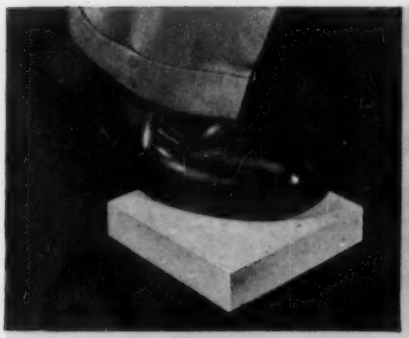
FOAMED PLASTIC

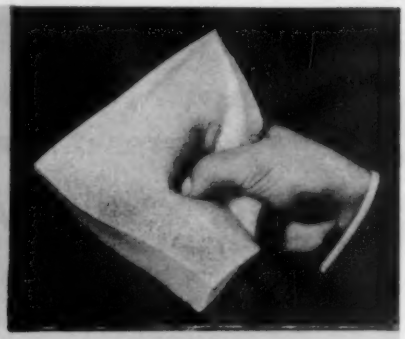
. . . that finds an important new function almost daily



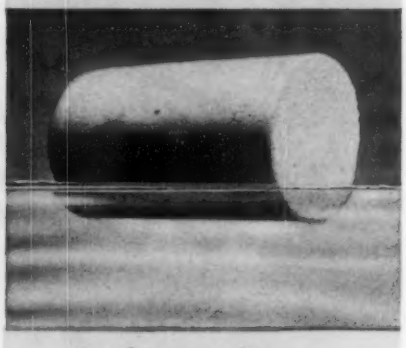


Choose your density





Rigid or flexible . . . as you like



Resists moisture

The properties we can't illustrate are at least as important as those we can

Near-perfect
Radar transmission

Ease of Fabrication
It's "poured-in-place"

Great Strength
with Light Weight

Wide Range of Densities
from 2 to 35 lb/cu ft

Good Thermal Insulation
"K" Factors
.018 at 8 lb/cu ft
to .025 at 11 lb/cu ft

Excellent Electrical Properties
6 lb/cu ft Lockfoam tested
at 9.375 KMC
Dielectric Constant 1.05
Loss Tangent .0005

Available in sheet form

Great versatility
50 different and
consistently reproducible
formulations available

A few of Nopco Lockfoam's present uses

Airplane Radomes, Potting Electronic Instruments, Reinforcing Automobile Doors, Automobile Arm Rests, Packaging, Shock Panelling, Instrument Cases, Insulating Water Coolers and Refrigerators, Cushioning, Walls for Portable Units, Buoys.

Our technical staff will give you every assistance in choosing among Lockfoam's 50 different formulations, and in making its economies *your* economies.

Write today for the Nopco Lockfoam booklet.

Nopco Chemical Company,
148 Stier St., Harrison, N. J.

NOPCO

PLASTICS DIVISION

HARRISON, NEW JERSEY

Los Angeles, Calif.

allows it to be started the compressor against 3,000-psi. loads at—65F, making it unnecessary to "blow down" the compressor discharge line.

A patented piston cross head design eliminates side thrust on the piston, minimizing wear on pistons and cylinder walls.

In the pneumatic component field, Cornelius is marketing a zero-leakage air check valve which will not leak at pressures up to 4,500 psi. nor with differential pressure as low as 0.5 psi. Its features include:

- **Metal-to-metal high-pressure seal** combined with rubber-to-metal low-pressure seal.
- **Streamlined poppet** and "straight-through" air flow providing high flow capacity with minimum pressure drop.
- **Rubber seat** designed to prevent "wash-out" during high surge flow conditions. The rubber used is impervious to compressor lubricating oils.
- **Poppet spring** not exposed to or affected by air flowing through valve.
- **Large seating** area allowing valve to function under icing conditions and when exposed to foreign particles in the air flow.

Other Cornelius developments are single or dual emergency air brake valves which meter air to the brakes, allowing controlled rate of deceleration; conventional valve dumps all the air and locks the brakes.

The Cornelius Co. was begun in 1930 when Dick Cornelius and his father ("We didn't have a dime between us") started building "junk" in a garage. The junk was oil burners to convert coal furnaces.

When beer came back in 1932, the father-son team gradually drifted into beer dispensing equipment.

In 1940, the Army Air Corps handed Cornelius an air compressor made by a large U. S. manufacturer and asked him to build it in quantity for B-29 gun turrets (for gun charging). Cornelius did not like the compressor's design, so he and his co-workers created and built a three-stage, 0.4-cfm., 1,500-psi. compressor in 10 days. Since no electric motor was available to drive the unit, the Cornelius group designed and built a ½-hp. motor for the compressor. The motor was half as heavy and much smaller than anything that had been available.

This put Cornelius in the aviation business, and he has been in it ever since.

During the last war, the company made thousands of compressors for the B-29—seven per plane. Five were for the ship's gun turrets; two for dual bomb bay doors.

The company gradually expanded into the design and manufacture of pneumatic components such as air bottles, pressure regulators, valves and anti-G valves.

When a demand arose for hydraulic motor-driven compressors, the company developed its own. One reason was so it could remain independent of outside suppliers. Another was that the pump had to have a straight-through shaft to drive the compressor on one end and a cooling fan on the other, and suitable pumps then on the market were all angled.

The pump was built integrally with the compressor, eliminating weight and space required by mounting flanges.

Company technicians could not find precision machines needed to do the job they wanted on the pump, so they bought the best available and converted the machines to manufacture pump parts the way they wanted them. Cornelius describes his pump as a "metallurgical nightmare."

Among the non-airborne uses of Cornelius compressors are the servicing of aircraft landing gear struts, accumulators and emergency air bottles; supplying of air for demand type breathing apparatus such as that used by fire fighters, and charging underwater diving equipment.

In 1952, the company moved into a new, 64,000-sq. ft. plant in Minneapolis. Today Cornelius employs about 350 persons and does a $3-million yearly business.

It's a small world,
but you can hit it if
you fly without a
LEAR ARCON.

NEVER fly in instrument weather without an instrument rating!

Have you heard about Permadizing?*

*Stillman's exclusive Permadizing Process can solve your rubber-to-metal bonding problems with completely flash-free parts. Steel-smooth sealing surfaces allow effective sealing at almost zero pressure.

Send for illustrated catalog SR-2

Stillman Rubber Co.

23525 Lorain Rd., Cleveland 26, Ohio - 5811 Marilyn Ave., Culver City, Calif.

Fluoroflex-T assemblies solve high temperature hose problem

for Fairchild small jet engine

Big feature about small jet engines is the good power-to-weight ratio. One of the first in this field, the Fairchild J-44 turbojet engine now uses flexible plumbing that not only saves weight but also withstands the high operating temperatures.

Fluoroflex*-T R-3800 hose assemblies were selected to do this job. And for the best of reasons: they are 500° F lines . . . corrosion-proof . . . with small O.D., extra light weight, and over 2 years of successful experience in service.

Resistoflex is the originator and developer of flexible hose lines using a tube compounded from Teflon* and which have A-N approval in all sizes for synthetic fuels and oils, and nitric acid. *Send for Bulletin FH-2.*

**Fluoroflex is a Resistoflex registered trade mark for products from fluorocarbon resins. Teflon is the DuPont registered trade mark for its tetrafluoroethylene resin.*

RESISTOFLEX *Corporation*
Belleville 9, N. J.

Light Alerts Pilot Of Power-Line Peril

A warning light that tells pilots of dangerous power cables will be manufactured by the Airway Signal Corp., Vancouver, Wash.

Developed under the direction of Prof. H. J. Dana, of the division of industrial research, Institute of Technology at Washington State College, the new light can be positioned on the power line spans with a remote-controlled trolley which pushes the light onto the span, clamps it in place, and returns it for removal (AW Jan. 7, 1952, p. 54).

The light takes its current from the induction field around the power line, eliminating need for connections.

Civil Aeronautics Administration is reported to have approved the device after tests by the National Bureau of Standards.

Fifteen of the experimental lights are being tested, two in Missouri and 13 in the Pacific Northwest.

A modification, in which a booster transformer increases the light's brightness three to four times, adapts it for lines carrying low current. The modified unit is being tested now near the Pullman-Moscow airport, a few miles from the State College campus.

Ground Broken For TWA Idlewild Base

Plans are being made for a $12-million hangar facility designed to become the heart of Trans World Airlines' new $15-million Atlantic division maintenance base at Idlewild Airport.

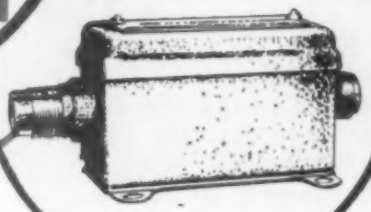
The hangar dimensions will allow it to hold 12 Super Constellations simultaneously and to accommodate aircraft with tails up to 44 ft. high. The structure will be of dual cantilever design and concrete construction. It will be over 800 ft. long and 400 ft. wide—the width including two 160-ft. aircraft bays and an 80-ft. center section for offices and shops.

The 65-ft.-wide door leaves will operate in groups of three, providing openings up to two-thirds the length of the hangar.

The parking apron of 12-in. concrete will hold up to 22 Constellation-type aircraft at once. Telephones will be placed at the various aircraft parking areas to allow instructions for parts or other requests to be called in instead of requiring time-consuming trips to the hangar.

Other buildings on the base will be a commissary and an automotive garage, ground for which has been broken. Completion of the entire base is sched-

GLA ignition . . .



on the

Fairchild J44

. . . *the compact engine that powers the Ryan Firebee!*

This specially designed ignition unit for the J44 is engineered with the same skill, built with the identical precision that goes into all G.L.A. ignition equipment.

And G.L.A. ignition is used on many of the *giant-turbined* aircraft which hunt the Firebee down!

GENERAL LABORATORY ASSOCIATES, INC.

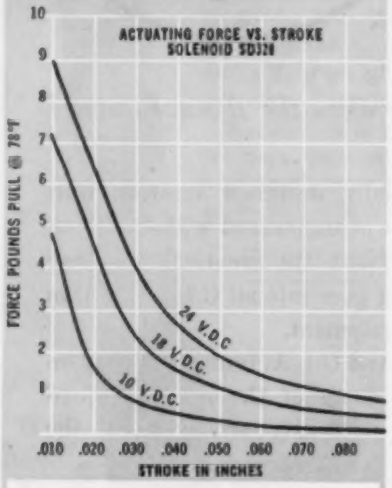
Norwich GLA New York

AIRCRAFT IGNITION AND ELECTRONIC EQUIPMENT

WEST COAST SALES & SERVICE, 3903 Warner Blvd., Burbank, Calif., Victoria 94390

MIGHTY!

PSP MINIATURE SOLENOIDS deliver high actuating force at short stroke, low voltage



Little . . . but mighty! That's a capsule description of PSP Miniature Solenoids for computers, memory units, valves and other electronically controlled systems requiring short strokes and extreme control accuracy.

Ambient temperature range −65°F to +165°F . . . continuous duty at 18 to 30 Volts DC . . . pounds pull as shown in table above.

LARGEST MANUFACTURER ON THE PACIFIC COAST PRODUCING AIRCRAFT QUALITY SOLENOIDS EXCLUSIVELY

PSP SOLENOIDS

Send for your free copy of the informative PSP Catalog —today

PSP ENGINEERING COMPANY

8420 Otis Street, South Gate, California

In New York, New Jersey & Connecticut, contact Michael W. Stollmack, 277 Broadway, New York 7, N.Y. Phone COrtlandt 7-4330

In Texas, Oklahoma, Kansas & Missouri, contact J. S. Neely, P.O. Box 9822, Fort Worth, Texas

Northwestern Representative, Seatronics, Inc. 911 Western Ave, Seattle, Washington • Phone: Main 9846

uled for mid-1957.

The hangar plans are being prepared by Ammann & Whitney, New York, and Burns & McDonnell, Kansas City, Mo.

Slick Modernizes Ground Equipment

Slick Airways is spending close to $75,000 on a cargo-handling reequipment program designed partly to replace and partly to supplement present equipment.

The freight carrier's program calls for nine Clark forklifts, two Lafferty electric tug bars, four Toledo scales, two baggage carts and three Chevrolet high-lift trucks. The equipment will be located at various Slick ground stations.

The modernization program was begun this summer and is expected to be completed soon.

OFF THE LINE

First commercial carrier to service-test BG Corp.'s new platinum electrode spark plug is Western Air Lines. Tests ending in November will determine whether the RB39R plug can go a full 1,000 hours without removal. WAL's route structure is such that the tests will give good short-run information and cruise data, according to BG. The plug has a ¾-in.-20 hermetically sealed "all weather" top, and is approved for installation in all models of Pratt & Whitney Aircraft R4360, R2800, R2000 and R1830 engines. BG says the RB39R has been successfully service-tested by the Air Force.

All-weather spark plug for executive aircraft seals against moisture, dirt and salt, regardless of altitude. AC Spark Plug, maker of the HSR-86, says dependability of the plug at all altitudes has been proved by millions of hours of flight on military and commercial planes.

TWA is using a standard agitator-type clothes washing machine in tests of a new method of cleaning the disk-type pressure engine oil strainers installed on all of the airline's engines. Six of the strainers are placed in the machine simultaneously; Drews carburetor cleaner solvent is added and the machine turned on; in five minutes the strainers are clean. Previously it took a half-hour to clean a single strainer.

Beryllium-copper strip rolled to .001 ± .0001-in. thickness is used as the pressure-sensitive diaphragm in an aircraft ice-detection control system. Minute variations in pressure on the strip are transmitted to electronic circuits which amplify the "danger signals" transmitted by the ultra-sensitive diaphragm. Maker of the strip is American Silver Co., 36-07 Prince St., Flushing, N. Y.

United Air Lines is adding a two-story hangar and new flight kitchen to its Seattle-Tacoma Airport facilities at a cost of over $1 million.

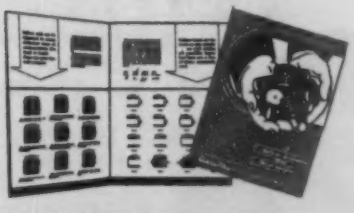
Boosted C-46F

Twin Marbore jet engines installed under fuselage of Transocean Air Lines C-46F have boosted takeoff payload by 10,000 lb., according to the airline. Experimental ship shown here recently completed a coast-to-coast roundtrip.

YOUR No. 1 SOURCE FOR COMPLETE BELLOWS ASSEMBLIES AND DEVICES

FULTON SYLPHON
BELLOWS HEADQUARTERS, U.S.A.

You gain three important advantages when you consult Fulton Sylphon, originators of the metal bellows—*1.* Over 50 years experience in bellows engineering is focused on your problem; *2.* Modern production facilities geared to good service; *3.* Cost saving opportunities through the design and production of complete bellows assemblies.



HERE'S HELPFUL INFORMATION
This 32 page catalog covers basic bellows engineering, conversion tables, metals available and other bellows data. Use the handy coupon for your free copy.

Mr. Controls

Robertshaw-Fulton
CONTROLS COMPANY

FULTON SYLPHON DIVISION
Knoxville 1, Tennessee

( ) Please have a Bellows Engineer call me for an appointment.
( ) Send me Bellows Catalog # UI-1400

Name_____ Title_____

Company_____

Address_____

City_____ State_____

A DESIGN FOR YOUR FUTURE AT . . .

MAC*

From an engineering organization, what do *you* consider the design requirements for a successful career?

- ✓ DESIRABLE SALARY STRUCTURE
- ✓ VARIED AND INTERESTING WORK
- ✓ PROFESSIONAL GROWTH POTENTIAL
- ✓ YOUNG AND AGGRESSIVE MANAGEMENT

We meet these specifications. If you are willing to supplement them with your own education, experience, ingenuity and initiative, an outstanding engineering career awaits you at M. A. C. . . . the McDonnell Aircraft Corporation.

Stimulating assignments available for experienced engineers in the fields of: structural and functional design, power plant analysis, structural engineering, aerodynamics, dynamics, and many others. Openings also exist for recent college graduates.

*MAKE AVIATION Your CAREER!

McDONNELL

WRITE . . . TECHNICAL PLACEMENT SUPERVISOR, P. O. BOX 516, ST. LOUIS 3, MO.

Telling the Market

Automatic tracking theodolite and data reduction system. Project Digest No. PD-20, Cook Electric Co., 2700 N. Southport Ave., Chicago 14, Ill. . . . **Handbook on Boron Carbide and Elemental Boron,** booklet and precision grinding and lapping machines, Catalogue No. 1843, Norton Co., Worcester 6, Mass. . . . **Resistor Engineering Guide,** International Resistance Co., 401 N. Broad St., Philadelphia 8, Pa.

"Kel-Ray" projectors, gamma ray sources for industrial radiography, booklet, Metal & Thermit Corp., 100 E. 42 St., New York 17, N. Y. . . . Wall charts: **How to Select the Right AN Connector** and **How to Specify the Complete Connector Assembly,** Deutsch Co., 7000 Avalon Blvd., Los Angeles 3, Calif.

4MA and 5MA **Push Button Actuators,** Data Sheet P99; **Appliance Switches,** Data Sheet 106, Micro Switch, Division of Minneapolis-Honeywell Regulator Co., Freeport, Ill. . . . **Epocast 4-B and 4-B-2 Filled Epoxy Resins,** Bulletins EP-S4-10a, b,c; **Epocast 4-C and 4-D Filled Epoxy Resins,** Bulletin EP-55-61, Furane Plastics, Inc., 4516 Brazil St., Los Angeles 39, Calif.

Electric heating elements, Publication EC-53, Cutler-Hammer, Inc., 445 N. 12th St., Milwaukee, Wis. . . . Series 6300 **differential pressure switches** for aircraft and missile system applications, catalog sheet, Southwestern Industries, Inc., 5880 Centinela Ave., Los Angeles 45, Calif. . . . No. 99 cold-applied **paving joint sealer for jet airfields,** bulletin, Presstite Engineering Co., 3798 Chouteau Ave., St. Louis 10, Mo.

Special report, **Radiant Heating and Snow Melting for Airport Installations,** made by Engineering Service Dept., A. M. Byers Co., Pittsburgh, Pa. . . . **Electrolimit Jig Borers,** specifications and applications, Circular No. 587; **Vertical Precision Hole Grinder No. 2E,** Circular No. 589, **Developments in Numerical Control,** Circular No. 591; **New 24-in. Precision Plain Optical Rotary Table,** Circular No. 593; **42-in. Precision Plain Rotary Table,** Circular No. 594, Pratt & Whitney, Division Niles-Bement-Pond Co., W. Hartford 1, Conn.

WINNING MOODBEAMS # 10

We hope all your football teams are winners this season. We know they WILL be if they produce like the manufacturing teams SAC supports as one of the industry's major distributors. You CAN'T lose with factory-new parts backed by flying's All-Time All-American performers!

And speaking of winning ways, how about Bubble-Bathing Sally Merrill (19, blue eyes, golden hair, 5'4", 115 lbs)?

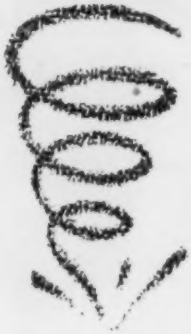
Footballs courtesy Doak Walker Sport Center, Inc.

AIRCRAFT TUBING

GOVERNMENT SPECIFICATION TUBING IN STOCK..

- A.I.S.I. 4130.....MIL-T-6736
- A.I.S.I. 4130.....AN-T-69
- A.I.S.I. X-4130.....AN-WW-T-850A
- A.I.S.I. 1025.....AN-WW-T-846

SERVICE STEEL • DETROIT, MICHIGAN LOS ANGELES, CALIFORNIA



The CAA reports that 561 stall-spin accidents occurred in 1954. Naturally not a single one of these planes was equipped with a **LEAR ARCON.**

NEVER fly in instrument weather without an instrument rating!

COMPONENT—PRODUCT
Qualification & Research

TESTING

for Industry and Government Agencies

One of the Nation's Largest and Best Equipped Commercial Testing Laboratories Specializing in Complete Qualification and Acceptance Testing to MIL Specs.

*

TEST EQUIPMENT

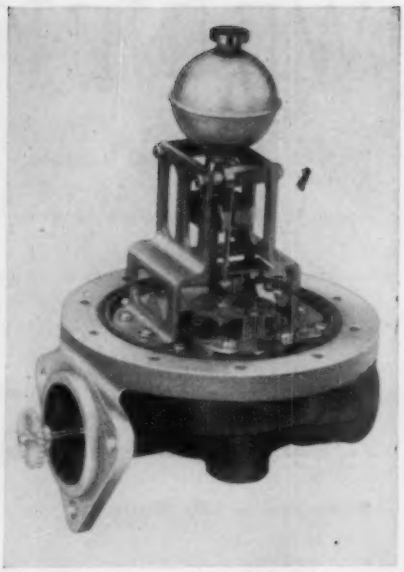
ENGINEERED AND CUSTOM BUILT

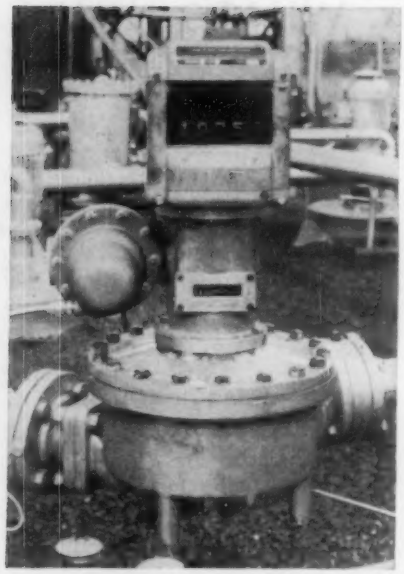
*

INLAND TESTING LABORATORIES

1457 Diversey Parkway, Chicago 14, Ill.

DIversey 8-6700





DENSITOMETER (left) provides continuous measurement of fuel density and enables ground fueling meter (right) to record fuel delivery directly in pounds. Revere Corp. of America is developing other similar installations for inflight refueling and for aircraft.

Meter Measures Fuel in Pounds

Direct measurement by weight of fuels transferred in refuelling operations on the ground or air-to-air will be provided by gravity metering systems developed by the Revere Corporation of America.

The company claims its new equipment, combining volumetric and density measurements to provide a fuel measurement in pounds, will be:

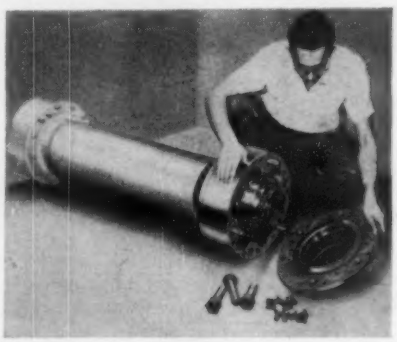
- **Accurate** to plus or minus 0.5%, for
- **Flow Rates** from 250 to 2,200 lb. per min.,
- **Densities** from 5.5 lb. per gal. to 7.4 lb. per gal., and
- **Temperatures** from −65 deg. F to plus 140 deg. F.

First units now being tested by USAF are for ground handling of fuel. These can be mounted on trucks or fixed fuelling installations.

The next units are for installation in air-to-air refuelling equipment. Revere, also is developing a design for use in aircraft, which will provide the pilot with a direct reading in lb. of fuel consumed in flight.

The equipment consists of an accurate but conventional volumetric meter a density meter, a mechanical converter and a standard register. In operation, the volumetric meter drives a piston which is coupled to the converter. At the same time, the density meter, called a densitometer, feeds a density factor signal into the converter. The converter automatically multiplies density and volume, with the result registered on the counter in pounds.

The equipment eliminates separate sampling and calculation of fuel density by the direct mechanical measurement of density during actual fuel flow. The Densitometer is a servo-controlled, self-balancing hydometer. A movable weight rides on a beam which has a float at its end. The assembly is immersed continuously in a flow of fuel. An hydraulic-motor-driven lead screw automatically positions and repositions the weight to balance out the moment resulting from the buoyancy of the float. A gear train transmits the result of this activity as a density measurement to the converter.



Largest Universal Joint

This 14½-in. o.d. universal joint is believed by its manufacturer to be the largest ever made. It is used to transmit power at constant velocity from engine by dynamometer on TWA's propellerless engine test stands recently installed at the carrier's Kansas City, Kan., overhaul base (AW May 23, p. 69). The joint was designed and built by Rzeppa Joint Div., Gear Grinding Machine Co., Detroit.

wherever engines are joined to airframes, LORD controls vibration

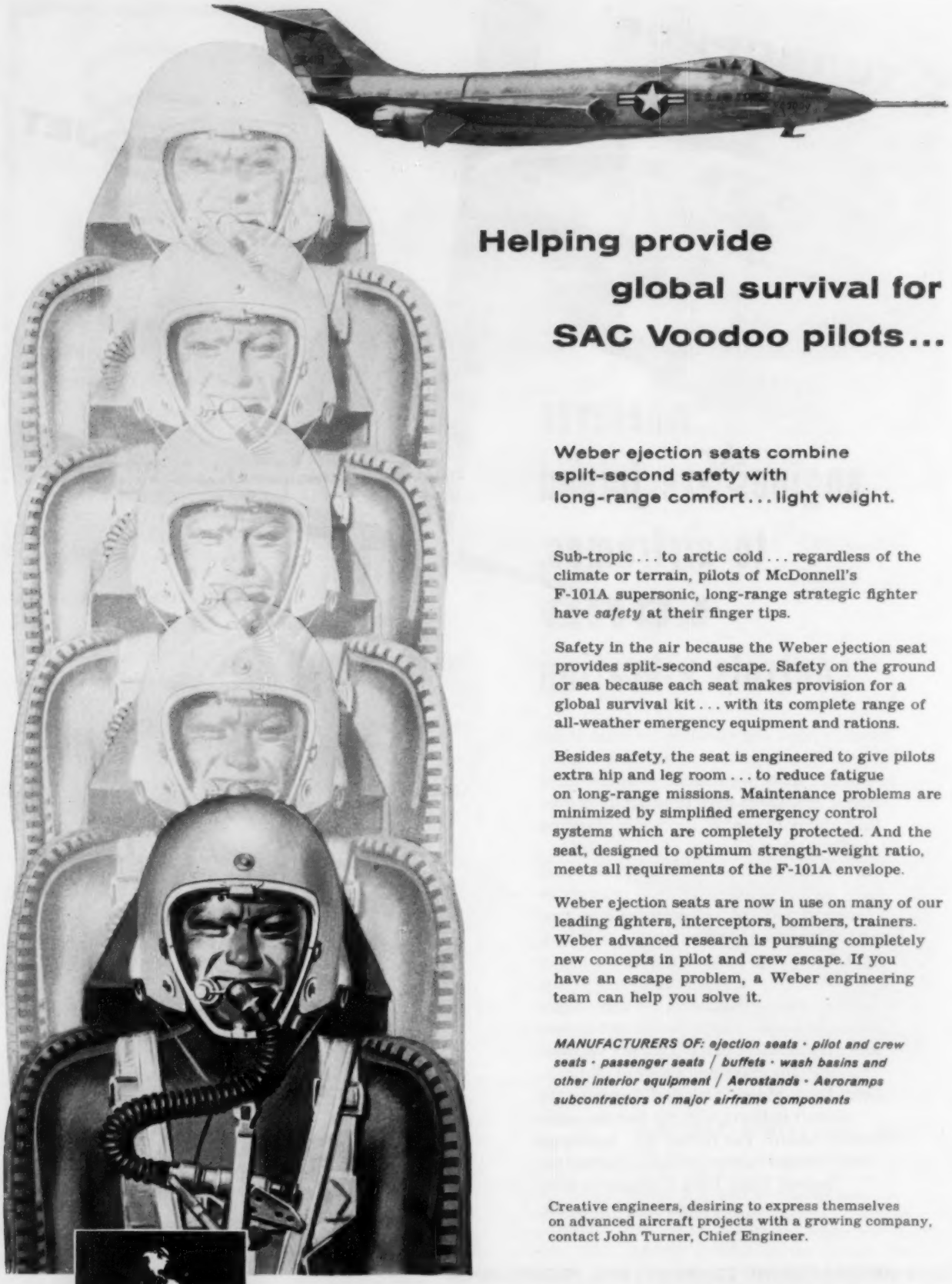
Effective noise and vibration isolation at the vital link where engine meets airframe is a key to smooth, quiet flight. LORD bonded-rubber engine mountings have consistently proven their ability to control the engine vibration level effectively in all types of power plants—turboprop, jet and reciprocating. On small planes or heavy bombers, military or commercial, under extremes of operating temperatures and environmental conditions, LORD mountings have an impressive record of performance, economy and safety. LORD aircraft engine mountings are lightweight, easy to install, longer-lasting and require fewer replacement parts. They are designed for maximum safety at all times. LORD has a 25-year record of supplying the aircraft industry with the best in engine vibration control. For further information on LORD bonded-rubber products, contact the nearest LORD Field Engineer or write the home office, Erie, Pa.

LORD BONDED RUBBER

designers and producers of bonded rubber products since 1924

LORD MANUFACTURING COMPANY • ERIE, PENNSYLVANIA

NEW YORK, N. Y. · Circle 7-3326 • PHILADELPHIA, PA. · LOcust 4-0147
CLEVELAND, OHIO · SUperior 1-3242 • DAYTON, OHIO · Michigan 8871
DETROIT, MICH. · TRinity 4-2060 • CHICAGO, ILL. · Michigan 2-6010
DALLAS, TEXAS · Riverside 3392 • LOS ANGELES, CAL. · HOllywood 4-7593
"In Canada—Railway & Power Engineering Corporation Limited"



Helping provide global survival for SAC Voodoo pilots...

Weber ejection seats combine split-second safety with long-range comfort... light weight.

Sub-tropic . . . to arctic cold . . . regardless of the climate or terrain, pilots of McDonnell's F-101A supersonic, long-range strategic fighter have *safety* at their finger tips.

Safety in the air because the Weber ejection seat provides split-second escape. Safety on the ground or sea because each seat makes provision for a global survival kit . . . with its complete range of all-weather emergency equipment and rations.

Besides safety, the seat is engineered to give pilots extra hip and leg room . . . to reduce fatigue on long-range missions. Maintenance problems are minimized by simplified emergency control systems which are completely protected. And the seat, designed to optimum strength-weight ratio, meets all requirements of the F-101A envelope.

Weber ejection seats are now in use on many of our leading fighters, interceptors, bombers, trainers. Weber advanced research is pursuing completely new concepts in pilot and crew escape. If you have an escape problem, a Weber engineering team can help you solve it.

***MANUFACTURERS OF:** ejection seats · pilot and crew seats · passenger seats / buffets · wash basins and other interior equipment / Aerostands · Aeroramps subcontractors of major airframe components*

Creative engineers, desiring to express themselves on advanced aircraft projects with a growing company, contact John Turner, Chief Engineer.

WEBER AIRCRAFT CORPORATION

2820 Ontario Street, Burbank, California

LETTERS

Facts About Airpower

I should like to take this opportunity to commend AVIATION WEEK for its bold, courageous and patriotic editorial policy. I know of no other publication that contains so much valuable aeronautical information and, at the same time, points up so clearly the pertinent facts as to the true state of our national defense.

Because this latter information must be of great concern to all Americans I have long wished that your publication could reach an audience beyond the circles primarily interested in aviation. Consequently, I was glad to have an opportunity to quote from your own excellent editorial of July 11, 1955 ("Kidding the Public on Russian Airpower") in my article in *This Week* Magazine, which has a popular circulation of about 12,000,000.

Like yourself, I strongly feel that unless the American people as a whole are enlightened on the subject of airpower and aroused to spontaneous action to remedy the chronic ills that plague our national defense planning, we will continue to retrogress vis-a-vis our potential enemy to the point of disaster.

ALEXANDER P. DE SEVERSKY
30 Rockefeller Plaza
New York 20, N. Y.

CAA Door Is Open

In the Sept. 12, 1955, issue of your magazine, Capt. R. C. Robson again directs his criticism toward the traffic control studies in progress at the CAA Technical Development Center at Indianapolis ("Echo From ACC," p. 151). He reports that a previous verbal foray against the same activity in your May 17, 1954, issue resulted in his being taken to task "by those connected with the program."

The Franklin Institute of Pennsylvania, which has worked with us in these studies, did write a letter to the editor protesting Capt. Robson's earlier remarks. This letter was dignified and restrained, it was never published, and to my way of thinking could not be described as taking anyone to task.

For our own part, we have never taken issue with Capt. Robson. We certainly do not agree with his views in this instance, but we respect his right to air his opinions, or those of his friends, however ill-founded they may be.

As was pointed out in the Franklin Institute letter, our door is always open. We welcome honest and informed criticism and suggestions, and are glad to discuss our work with anyone having a legitimate interest. Capt. Robson has never paid us a visit. If he has a sincere desire to offer some constructive thoughts, outside the public press, on traffic control development, we would be glad to see him at any time.

D. M. STUART, Director
CAA Technical Development
and Evaluation Center
Indianapolis 21, Ind.

Aviation Week welcomes the opinion of its readers on the issues raised in the magazine's editorial columns. Address letters to the Editor, Aviation Week, 330 W. 42 St., New York 36, N. Y. Try to keep letters under 500 words and give a genuine identification. We will not print anonymous letters, but names of writers will be withheld on request.

KLM & Britannia

On page 9 of AVIATION WEEK of Aug. 15 it was stated that "KLM Royal Dutch Airlines has advised Bristol Aeroplane Co., it would consider the turboprop Britannia transport only as a freighter aircraft."

This statement has come to the notice of both KLM and the Bristol Aeroplane Co. and we wish jointly to inform you that the statement is entirely without foundation.

R. J. VOGELS
Director of Public Relations
K.L.M. Royal Dutch Airlines
P. O. Box 121
The Hague, Netherlands
P. E. GORDON-MARSHALL
The Bristol Aeroplane Co., Limited
Filton House
Bristol, England

(AVIATION WEEK's *information came from a responsible official involved in the KLM-Bristol discussions.*—ED.)

Area Rule Limited?

Let me contribute the following comments concerning the subject of the article on the NACA supersonic design formula and related editorial in the Sept. 12 issue of AVIATION WEEK, pages 12 and 154 respectively.

The simplicity of the "area rule" for determining the most efficient figuration of supersonic flight aircraft and missiles, derived by the NACA and recently so widely publicized, would indeed be gratifying—if it were strictly correct; unfortunately, it appears that it is not.

Although this rule affords useful results, it does not ascertain the optimum possible figuration. Furthermore, the information obtained applies roughly for just sonic speed, while for supersonic speeds the Coke-bottle restriction of the body should be considerably aft of that dictated by the area rule.

It should be noted that while the sonic condition is important as to the structural strength of the aircraft, the condition at the design supersonic speed is determinant for the capacity required and the fuel consumption of the propulsion equipment. It seems illogical to shape an aircraft to suit a condition lasting at most a few seconds, in spite of the fact that (owing to the accumulative effect) the conditions at exactly sonic speed are most severe.

"Get Your Air the Positive Way"

USED BY
THE AIRCRAFT INDUSTRY FOR:

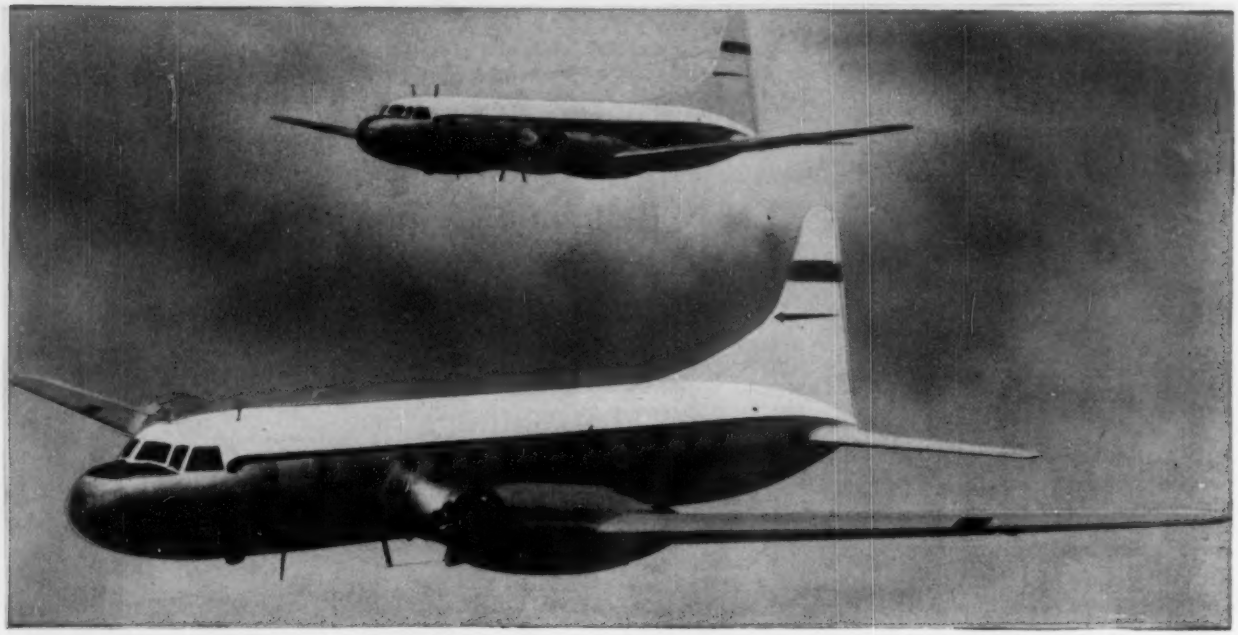
- Jet Engine Starters
- Cabin Pressurization
- Simulated Altitude Conditions
- Ground Air Conditioners

SUTORBILT
CORPORATION
2008 East Slauson Avenue
Los Angeles 58, Calif.
Main Plant: LUdlow 7-2228
Sales Office: LOgan 8-2226

Tall ones, short ones, big ones or small ... Burns Aero aircraft seats adjust to fit the problem. They can take it too ... light, but strong for military and airline use ... light, strong and luxurious for the private and executive aircraft. Burns Aero designs and manufactures to individual requirements for national and international airlines and a major portion of the N.B.A.A. Fleet. Write, wire or phone today for further information.

BURNS AERO SEAT CO.
3900 COHASSET STREET
BURBANK, CALIFORNIA
BURNS

Pilot reaction is extremely favorable as flying time runs 30 days ahead of schedule in AF's turboprop evaluation program



Aeroproducts Turboprops prove outstanding performers as MATS testing program approaches 3,000-hour mark!

A new world's record in turboprop-powered flight has been set by the 1700th Test Squadron of MATS. Two Convair YC-131C aircrafts have flown a total of 46 hours and 20 minutes in a single 24-hour period . . . 23 hours and 10 minutes for each airplane.

This record flight was a part of the program now being conducted by MATS to demonstrate the utilization of turboprop-powered aircraft in scheduled transport operation. Performance of the twin turboprop YC-131C in flights has been far beyond expectations, and reaction of MATS pilots has been extremely favorable.

The outstanding reliability of Aeroproducts turbopropellers, as proved by the MATS program, is a result of the engineering leadership which Aeroproducts has maintained in the development of turbopropellers. For example, Aeroproducts turbopropellers—

- made the first U. S. turboprop flight.
- have over 8,500 hours of flight time —more than all other U. S. turbopropellers combined.
- have the first established overhaul time for any U. S. turbopropeller.
- are CAA Certificated.

This superb background is an outstanding recommendation for application on any turboprop aircraft.

General Motors engineering leads the way

Building for today...Designing for tomorrow

Aeroproducts

ALLISON DIVISION OF GENERAL MOTORS • DAYTON, OHIO

As is well known, at sonic and supersonic speeds, wave resistance constitutes by far the major component of the total drag; it leads to compression energy continually being propagated away from the aircraft.

Wave-Producing Contours

Correspondingly, it should be emphasized that the shape of the ideal least resistance revolution-body prototype for sonic or supersonic speeds is essentially determined by its wave producing characteristic and only to a much lesser degree by sectional area relations.

Therefore, it is the wave-producing contours (intersection of wave producing surfaces with planes transversal to flight) upon which the balancing of the actual aircraft with the ideal prototype is to be foremostly based.

Evidently, these contour relations are different from sectional area relations: while the former are linearly proportional to dimensions, areas vary with their square. Besides, a wave-generating contour pattern is directional in emission of wave energy, so that in the aircraft's vicinity the wave energy is distributed unevenly and only at considerable distance the energy distribution becomes uniform (chiefly owing to refraction); for instance, while the wave energy emission from a circular contour is uniform in all directions, it is larger in the direction of the small axis of an oval contour.

Lessening the Shock

The proposition is of course, to penetrate into the resultant Mach front steadily and with least resistance due to composite shock generation. As far as wave resistance is concerned, that means avoidance to the best practicable extent of locally intensified shocks due to superposition of waves originating from various parts of the aircraft.

This object is achieved by basing the development of the actual aircraft figuration from the body of revolution prototype, upon the wave-producing contour aspect rather than upon sectional areas; in this regard both length and orientation of these contours are influential.

Secondly, for speeds higher than sonic, due allowance would strictly have to be made for the rearward bending of the Mach waves as, with increasing Mach number, they transform from plane to conical: this effect tends to shift the required Coke-bottle insweep farther aft of the indication by the area rule. However, the taking into account of this tendency appears justified only when very high supersonic speeds are concerned.

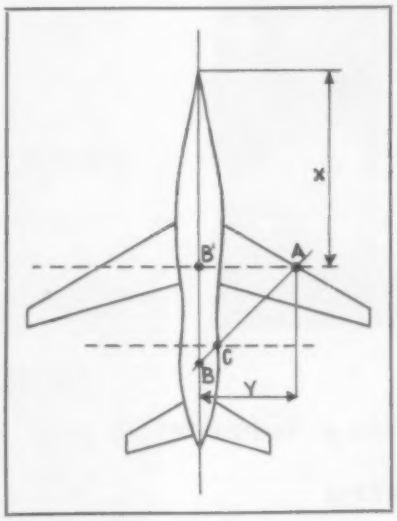
The involved relations become indeed even more complex when reflection of the Mach waves by parts of the aircraft is to be taken into account.

Influence of Sectional Areas

Thirdly, in regard to the influence of sectional areas, it is to be considered that air mass displacement relations (which conform to sectional areas) can become effective only in different transectional planes and the distance of the respective plane separation is a function of the location of the concerned section element and of the flight speed.

In other words, such causal relations do not apply for the same transaction. A point of the aircraft surface cannot sense, as it were, the magnitude of sectional areas present in the same transverse plane; the Mach front supplies at most vague indication of the vicinity of objects moving with the same speed and in the same direction.

These relations are illustrated by the accompanying sketch and, with regard to the argument to be presented, let it be reminded that an aerodynamic disturbance cannot be transmitted through the air faster than with sonic velocity.



Thus, an area element near **point A** cannot have any flow displacement effect on the fuselage section forward of **point C**, which is situated on **line AB**; with **point B** so located that during the interval an aerodynamic disturbance from A would reach point **B'**, the aircraft travels the distance **BB'** (at M = 1, **AB' = BB'**).

The same argument applies to any point of the aircraft's surface (by which of course sectional areas become respectively effective). Therefor, also the effect of areas tends to place the insweep of the fuselage towards aft of that indicated by the area rule.

Refined Procedure

Consequently, the formula recommended by Mr. Whitcomb can at best be regarded as a rough approximation.

Apart from the due discipline of a rigorous treatment of this significant subject, in the writer's opinion, the entailed design error is conspicuous enough to warrant substitution of the area rule by a refined procedure, one which takes into account the essential of the above stated relations. A graphical method for finding the optimum figuration could be particularly suitable.

In the age of thorough analytic approach to engineering problems, it appears entirely unjustified to rely on a rule-of-thumb for answers of such vital import as the design of aerial weapons, where even little may count much.

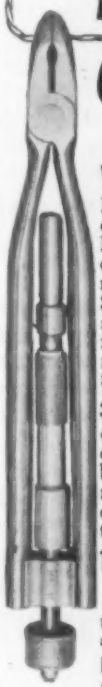
ERNEST LAGELBAUER
Lagelbauer Kinejet Corp.
410 East 13 St.
New York 9, N. Y.

You bet your life
when you fly
"weather" without a
LEAR ARCON.

NEVER fly in instrument weather without an instrument rating!

Now!... the NEW

DIAGONAL GRIP-HEAD



ROBINSON WIRE TWISTER

Faster, more efficient than ever! The new, slendernose DIAGONAL GRIP-HEAD is designed especially for those narrow, hard-to-reach places. Split-second whirling action safety-wires 3 engines in time required for one by any other method . . . saves as much as $140 per engine assembled.

3-TOOLS-IN-1 . . . pliers-cutters-twisters. Side-cutting, oil-tempered head. Permanent bronze bearing. No adjustments. Jaws lock on wire, can't slip off. Perfect, uniform twist every time.

12" —for assembly line safety-wiring, 15 oz. **$21.50**

9" —for bench work, sub-assemblies, 12 oz. **$20.50**

Unconditional Money-Back Guarantee. Send for complete details.

RALPH C. ROBINSON CO.
Box 494W No. Sacramento 15, Calif.

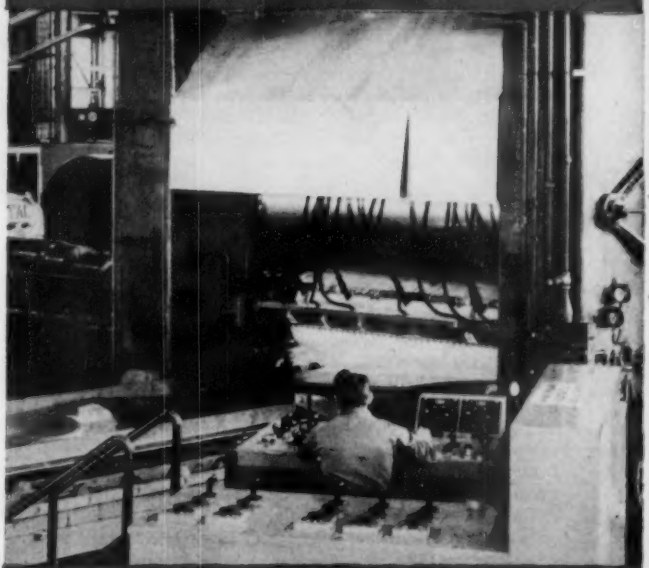
THIS AD APPEARS EVERY WEEK

AVIATION WEEK

Buyers' Guide

A McGRAW-HILL PUBLICATION

MISSILES:
Airframe and components
Equipment, including ground-handling,
Powerplant



SUPPORTING GROUPS: Data systems computers, punch-card systems etc., Electrical, Ground equipment, Hardware, Hydraulics, Instrumentation, Materials including fuels, chemicals, plastics, metals, etc. Tooling including machine tools, optical jigging systems, hand tools

Brings A Unique, Long-Needed Publishing Service to the Aviation Industry

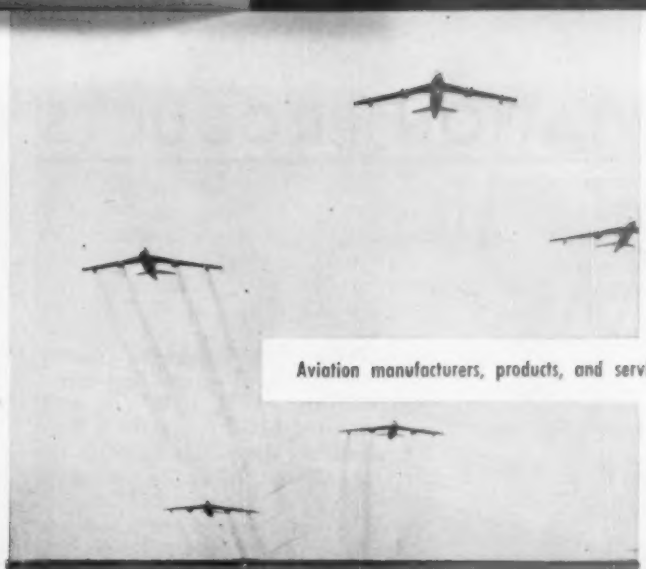
November 28, 1955, an all-important, needed publishing service will be available to the aviation industry . . . AVIATION WEEK's Annual BUYERS' GUIDE. The dramatic development of aviation into today's multi-billion dollar giant—reaching into all phases of manufacturing—demanding a constant flow of products and materials from tens of thousands of separate suppliers—has made a comprehensive, complete source book of suppliers and manufacturers a must for all segments of the Industry. AVIATION WEEK's BUYERS' GUIDE answers this intelligence need with an information service of year-'round usefulness, placed directly into the hands of some *57,000 key aviation engineers, management men, design and purchasing personnel—men who make up aviation's real buying influences . . . in the industry itself, in the Air Force, and throughout the Government.

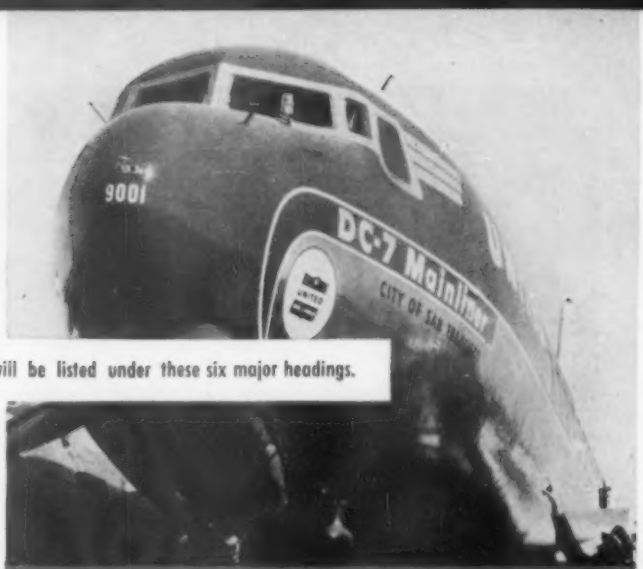
The latest developments in military procurement will be covered in a special report. Included in the detailed information to be presented will be: Air Materiel Command—Air Research and Development Command buying practices, personnel listings—by name, procurement centers, etc.; All-inclusive listings of manufacturers of aeronautical and allied products, sectionalized for maximum utility under six major headings: **Aircraft, Missiles, Avionics, Supporting Groups, Nuclear Power Systems, Airlines and Airports.**

Indexing is set up to provide quick, easily referred-to locators for all products. In addition, advertisements and product listings will be keyed to each other for ready reference. AVIATION WEEK's BUYERS' GUIDE also will carry Trade Name and Distributor listings—making this publication **the most complete single source of buying information available to the aviation industry today.**

Every AVIATION WEEK subscriber will receive the BUYERS' GUIDE. That's a market of some *57,000 key aviation people . . . plus substantial bonus circulation through the sale of extra copies of the BUYERS' GUIDE to aviation companies and government agencies (Price for additional copies is $3.00 each). AVIATION WEEK's BUYERS' GUIDE will be read, referred to, and depended upon constantly wherever aviation business is transacted.

McGraw-Hill Publishing Company, Inc., 330 West 42nd Street, New York 36, N. Y.: Other Advertising Sales Offices: **Atlanta 3, Ga.,** 801 Rhodes-Haverty Bldg. **Boston 16, Mass.,** 350 Park Square Bldg. **Chicago 11, Ill.,** 520 N. Michigan Ave. **Cleveland 15, Ohio,** 1510 Hanna Bldg. **Dallas 1, Texas,** First





Aviation manufacturers, products, and services will be listed under these six major headings.

AIRCRAFT:
Airframe and components,
Landing gear, Powerplant
Armament, Fixed equipment

AIRLINES AND AIRPORTS:
Scheduled carriers, Non-scheduled carriers, Cargo carriers,
Ground equipment, Lighting

NUCLEAR POWER SYSTEMS:
Accessories and components
Design services
Reactor fabrication

AVIONICS: Communications systems & equipment, Radar-fire control systems & equipment, Instrumentation and controls, Navigation systems & equipment, Components and devices, Test equipment, Computers & data processing equipment

Be sure your complete line of products and services is listed in this basic book of buying information. Special discounts are offered for multipage and catalog-type advertisements. Your AVIATION WEEK representative will gladly help you plan your advertising to make the most economical and resultful use of the GUIDE. Call him today.

* Average net paid circulation, 51,893 (June, 1955 ABC Statement). Paid circulation of current weekly issues more than 53,000. Current weekly print order exceeds 57,000.

AVIATION WEEK

A McGRAW-HILL PUBLICATION ABP ABC

National Bank Bldg. **Detroit 26, Mich.,** 856 Penobscot Bldg., **London E. C. 4, England,** 95 Farringdon Street. **Los Angeles 17, Calif.,** 1111 Wilshire Blvd.
Pittsburgh 22, Pa., 919 Oliver Bldg. **Philadelphia 3, Pa.,** 17th and Sansom Streets. **San Francisco 4, Calif.,** 68 Post Street. **St. Louis 8, Mo.,** Continental Bldg.

Kaman HOK-1 helicopter rescuing flood victim in Farmington, Conn., area. (Hartford Times Photo)

HELICOPTERS SAVE HUNDREDS OF LIVES DURING FLOOD

Dramatic rescues by rotary wing aircraft became almost commonplace in the gray rain of August 19, 1955.

Disastrous as they were, the terrible floods in the northeast would have claimed many more lives without these ". . . wonderful, comforting and beautiful little donkeys of the air".

Kaman Aircraft is proud to have supplied part of the fleet of armed forces helicopters which lessened the tragedy.

The KAMAN Aircraft Corporation
BLOOMFIELD, CONN.

NEW AVIATION PRODUCTS

Face Mask Provides Wide Vision

New Scottoramic face mask has a one-piece plastic safety lens which increases side and forward vision. A double lip seal makes the mask more comfortable, resulting in less fatigue. Non-fogging is assured by the circular air-washing action of the cool air or oxygen supply.

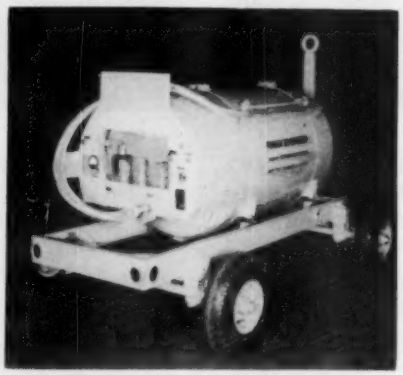
The mask is designed for aviation, industrial and fire-fighting use. Microphone and air hose are optional equipment.

Scott Aviation Corp., 275 Erie St., Lancaster, N. Y.

Lox Tanks Hold 50-500 Gal.

Three liquefied gas storage and transfer containers developed for use with liquid oxygen and nitrogen have working pressures of 50 psig. and design pressures of 180 psig.

• **Model Lox 50** holds 50 gal. or 5,762 cu. ft. of gaseous oxygen at 70F. The liquefied gas container weighs 447 lb. and is mounted on an MB-1 trailer. A built-in pressurizing coil permits a pressure build-up from 0 to 50 psig. in less than five minutes. The container will hold a vacuum below 50 microns consistently with liquid oxygen in the tank and has an evaporation rate of 2.5 to 4.5% by volume each 24 hours.

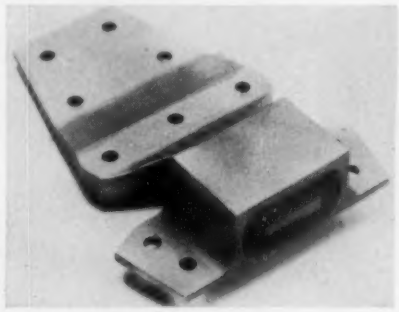


• **Model Lox 150** high-vacuum transportable liquefied gas storage and transfer container, holds 150 gal. or 17,286 cu. ft. of gaseous oxygen at 70F. The unit weighs 890 lb. A pressure of 50 psig. can be built up in less than five minutes. The container has an evaporation rate of less than 2.1% of volume each 24 hours.

• **Model Lox 500** storage and transfer container for liquid oxygen and nitrogen, weighs 2,340 lb. The tank can be pressurized to 50 psig. in less than five minutes. With liquid oxygen in the tank, the unit maintains a vacuum of less than 15 microns for extended periods of time. The manufacturer reports that models in use have held a vacuum below 5 microns for several months. Guaranteed vacuum loss is less than 10 microns per day. Capacity is 500 gal.

All three models are designed to USAF specifications.

Ronan & Kunzl, Inc., Cryogenic Div., Marshall, Mich.



Sandwich Mount Damps Shock

Aluminum and rubber sandwich support bracket and shock mountings, have been developed by Stillman Rubber Co. and Lockheed Aircraft Corp., to support after-body engine sections of the Lockheed 1049A.

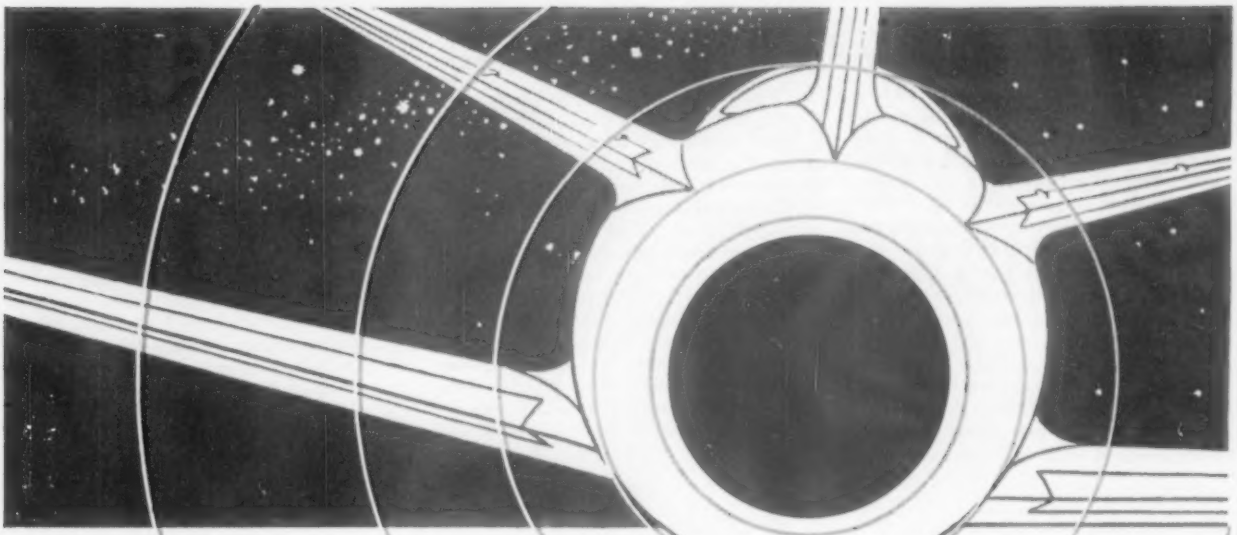
The Flexmount was designed to withstand applied loads in shear and additional loads caused by engine vibrations. Loads are taken out by 11/2-in.-dia. bolts, with the vibration completely absorbed by a Neoprene rubber core (1 1/8 x 1 1/8 x 1 1/4 in.) bonded to the aluminum. Operating temperatures range from −65 to 175F.

Stillman Rubber Co., 5811 Marilyn Ave., Culver City, Calif.

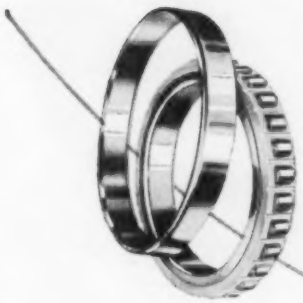
Sealant for Jet Airfields

Paving-joint sealant for jet airfields resists effects of fuel and tailpipe heat. It was designed for sealing sawed and formed joints in Portland cement concrete.

The sealant is supplied in two components: a liquid base consisting of synthetic rubber, plasticizers, vulcanizing agents, activators and inert fillers; and



Best Bets for Jets!



For more than a decade, HYATT has been breaking "bearing barriers" for jet engine designers.

As speed and heat ranges have steadily soared—posing problems no known bearings could solve—HYATT'S unsurpassed manufacturing and engineering facilities have consistently come up with "barrier-breaking" solutions.

So remember—when your design requirements outstrip the capabilities of ordinary bearings, call your HYATT sales-engineer *first*. He may already have the answer. If not, the chances are good HYATT can find it for you fast.

To break a "bearing barrier" in a hurry, call HYATT for help!

HYATT ROLLER BEARINGS

STRAIGHT BARREL TAPER

HYATT BEARINGS DIVISION • GENERAL MOTORS CORPORATION • HARRISON, NEW JERSEY

now FOR DC OR RESISTANCE INPUT

MODEL 200-A uses an input of 10,000 ohm resistance potentiometers as an input transducer providing 10 to 1 scale expansion and origin positioning. Available standard digital input accessories are essentially inputs of this type. Any resistance potentiometer will provide an analog input for this configuration.

MODEL 200-B, used for D.C. signal input, has full scale sensitivities of 5 millivolts and an input impedance of 1,000 megohms. Utilizing standard reference cells, this model provides drift-free operation. Available external reference voltages may be substituted. A plug connection is provided to facilitate the quick interchangeability of input sections.

now FOR SIMPLIFIED OPERATION

Precision Vernier Dials provide an accurate method for obtaining fine adjustment during operation. Optional point plot or continuous line plotting is a feature of both models. Selection is by front panel manual control. A new, simplified pen of one-piece design-used for point or continuous plotting—eliminates bottles and tubes, permits rapid changing of ink colors. Independent action of the X and Y axis is achieved with Librascope's unique "Floating Gear Train." No cables, tapes or lead screws to cause lost motion, cable stretching or drifting out of alignment. The 120° concave cylindrical plotting surface provides full visibility . . . is completely illuminated.

now FOR WIDER APPLICATION

These fast, dependable general purpose plotters feature 0.1% accuracy, are suited for wide applications where rapid graphic presentation of data is required, such as: laboratory testing, computers, data handling systems, wind tunnel, missile tracking and quality control testing of transistors and other electronic components. Input selection includes Punched Card and Tape Converters, Decimal Keyboards and Binary Converters. Model 200-A can plot from Flexowriter tape in any code or directly from the Tape Punch cables of many digital computers. Subchassis can be supplied to handle time-shared X versus Y plots, or other special circuitry. Write today for details.

LIBRASCOPE X-Y PLOTTER

HIGHEST ACCURACY FOR GRAPHIC DATA HANDLING

Greater input flexibility | For desk or rack mounting

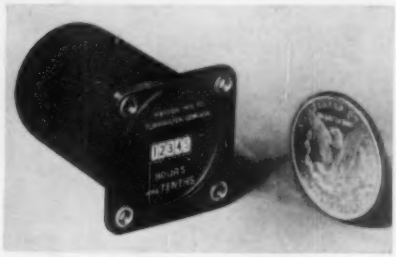
NEW LIBRASCOPE PUNCHED TAPE CONVERTER
Operates from a punched tape reader—Specially designed for Librascope X-Y Plotters—This unit is adaptable to other plotters.

LIBRASCOPE PUNCHED CARD CONVERTER
Converts punched card data to analog form for input to X-Y Plotters. Automatic Position for feeding 50 punched cards per minute.

LIBRASCOPE INCORPORATED • 808 WESTERN AVENUE • GLENDALE, CALIFORNIA

a dry curer consisting of accelerators blended with suitable extenders.

Presstite Engineering Co., 3798 Chouteau Ave., St. Louis, Mo.



Elapsed Time Indicator

Small elapsed time indicator for aircraft has a synchronous motor drive, comes in a 1½-in.-dia. case 2¾ in. long. It weighs less than 6 oz. and uses 2 w. of 115-v. 400-cycle power.

The indicator is available in two models—one indicating hours in 1/10 hour steps, the other minutes in 1/10 minute graduations to 9,999.9 min. The units are glass-to-metal hermetically sealed.

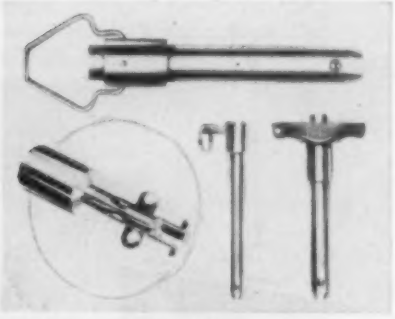
Haydon Manufacturing Co., Inc., Torrington, Conn.

Sequence Valves for 3,000 Psi.

Series 4000 line of slide-type sequence valves for 3,000-psi. hydraulic service features low leakage and low pressure drop.

The valves are supplied in either plunger-operated or lever-operated models, provide flow in either direction from pressure port to outlet port when plunger is depressed. When plunger is extended, flow is blocked from outlet port to pressure port.

Aircraft Products Co., 300 Church Road, Bridgeport, Pa.

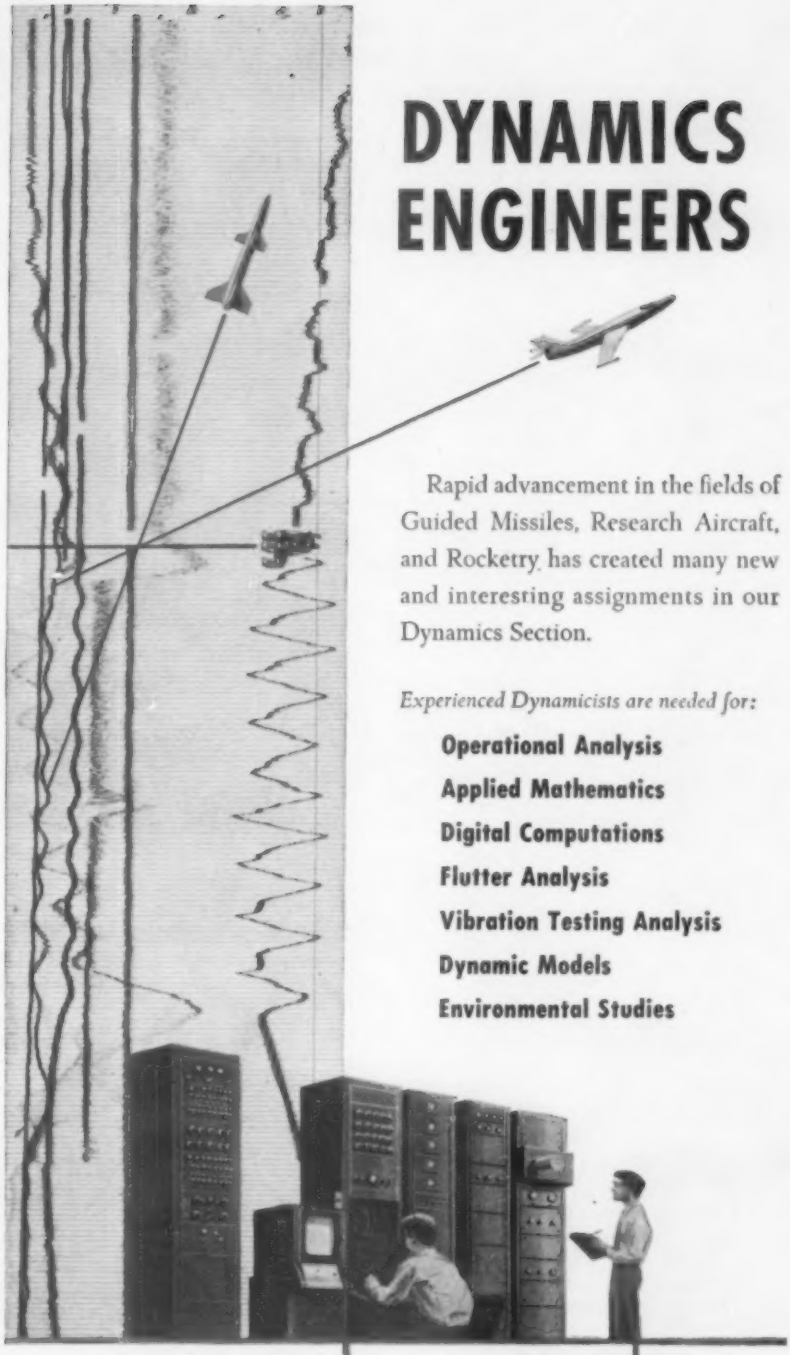


Safety Locking Pins

New Ball-Lok pins embody a fast lock and release principle and positive safety lock. Pins are single-action type, either push or pull. The release button must be depressed to disengage the lock at the time the pin is pulled.

Pins are also available in remote control and mallet driven types.

Made by **D. W. Price Corp., Los Angeles;** sold by **Rowe Sales Co., 2140 Westwood Blvd., Los Angeles 24, Calif.**



DYNAMICS ENGINEERS

Rapid advancement in the fields of Guided Missiles, Research Aircraft, and Rocketry has created many new and interesting assignments in our Dynamics Section.

Experienced Dynamicists are needed for:

Operational Analysis
Applied Mathematics
Digital Computations
Flutter Analysis
Vibration Testing Analysis
Dynamic Models
Environmental Studies

Salary commensurate with background and experience. All replies confidential.

send complete resume to:

BELL Aircraft CORP.

MANAGER, ENGINEERING PERSONNEL
BELL AIRCRAFT CORPORATION
POST OFFICE BOX 1 BUFFALO 5, N. Y.

controlled performance

by Reeves INSTRUMENT CORPORATION

DAY OR NIGHT — FAIR WEATHER OR FOUL . . . whether the target is an airfield . . . railroad bridge . . . factory area . . . ammunition dump . . . shipyard or troop concentration, Reeves ground guidance systems provide the Air Force with an offensive threat capable of hitting the bullseye every time — sight unseen. Tested during the Korean war, the control equipment illustrated below is the tactical unit developed and produced by Reeves on which the U.S. Air Force depends . . . both at home and abroad. This completely automatic guidance control is capable of directing any type of missile or airplane, either with or without pilot.

Reeves has a thoroughly trained engineering group available at all times to help you solve any guidance problem. In addition to Command Guidance Systems, Reeves has a wide experience with all three Services in the development of Radar, Gun Fire Control, Servo Mechanisms, and Computing Systems of all kinds. Their extensive facilities are available for all types of prime or sub-contract operations

Reeves INSTRUMENT CORPORATION

Reeves Command Guidance Systems

REEVES INSTRUMENT CORPORATION

A Subsidiary of Dynamics Corporation of America

215 East 91st St., New York 28, N.Y.

4RV55AR

Aluminum Valves for Planes

Two-way aluminum-alloy flow valves for aircraft oils, fuels, air or fuel vapors are available in 1¼ and 2-in. sizes. They are said to be 50% lighter and have smaller envelope than conventional offset-flow two-way valves. Contacting surfaces are electrofilmed to provide lubrication and positive action.

Units have a working pressure of 60 psi., proof pressure of 120 psi. and are for temperatures from −65 to 160F.

Allen Aircraft Products, Inc., Ravenna, Ohio.

Balances Duct Pressures

Pressure compensator for balancing the end thrust of a pneumatic metal ducting system is applicable to bleed air systems in turbojet and turboprop-powered aircraft.

The primary bellows in the pressure compensator provides for thermal expansion, flexure and misalignment of the duct system. Compensators are made in sizes up to 8 I.D., handle air pressures of 250 psi. or over and temperatures up to 900F.

Arrowhead Rubber Co., Metal Products Division, 2310 Curry St., Long Beach, Calif.

ALSO ON THE MARKET

Environmental testing chamber permits simultaneous, individual testing of two portions of an operating system to temperatures ranging from −100 to 200C. The unit is suited for testing automatic control equipment and airborne systems where elements of the same equipment must operate under different environmental conditions.—Harris Refrigeration Co., 365 Walden St., Cambridge, Mass.

Kodak contour projector, Model 8, is a portable, bench-type unit adaptable for either horizontal or vertical projection gaging and "right reading." Designed for economical checking of small parts . . . . **Model 14-5,** designed for handling heavy parts, is equipped with a heavy-duty worktable supported by a 5-in. O.D. column, a full 17.5-in. throat clearance and a 26x8-in. worktable.—Eastman Kodak Co., Rochester 4, N. Y.

Coated abrasive wheel polishes all types of metal for plating, painting without using fine grit set-up wheels, rag or sisal buffs or brushes. The polishing and grinding wheel consists of hundreds of pieces of cloth-coated abrasives.—Minnesota Mining & Manufacturing Co., Dept. A5-266, 900 Fauquier St., St. Paul 6, Minn.

FOOTE BROS. GEAR AND MACHINE CORPORATION
takes pleasure in announcing the appointment of
PACIFIC SCIENTIFIC COMPANY
as Sales and Service Representative for Foote Bros. Precision Gear Division in the states of Arizona, California, Oregon and Washington

A natural integration for all of your aircraft power transmission needs . . . Pacific Scientific Company's experienced sales and engineering staff—plus Foote Bros. engineering-production team! Whether your requirements call for custom-designed aircraft assemblies and components or specification items, see Pacific first. They're backed by the vast engineering and manufacturing resources of Foote Bros., one of the world's leading producers of precision aircraft gearing.

PACIFIC SCIENTIFIC COMPANY OFFICES
1430 Grande Vista Avenue, Los Angeles 23, Calif.
25 Stillman Street, San Francisco 7, Calif.
421 Michigan Avenue, Seattle 4, Washington
Rm. 444, 339 West Broadway, San Diego, Calif.

FOOTE BROS.
Better Power Transmission Through Better Gears

The IF in IFR means you have a better chance of getting through IF you have a **LEAR ARCON.**

NEVER fly in instrument weather without an instrument rating!

Pre-Folded
Patent Pending
SENSITIZED PAPER
(Ammonia type and Moist type)

★ Saves Time
★ Easier to File
★ Easier to Handle
★ Neat and Compact
★ Saves Filing Space

FOR DRAWINGS THAT NEED TO BE FOLDED
Customers praise Universal Pre-Folded Sensitized Paper. It's custom made in any width to 42"; in any length to 100 yards and in precision folds of any width, 3" to 12".

UNIVERSAL BLUEPRINT PAPER CO.
318 BRYAN STREET FORT WORTH 2, TEXAS
Manufacturers of Sensitized Materials

UNDER WAY

. . . the development of NUCLEAR AIRCRAFT at CONVAIR--Fort Worth

Progress is being made in the Applied Nuclear Field at CONVAIR — Fort Worth — in nuclear analysis, design and experimentation, including the fields of shielding, radiation effects and nuclear aircraft technology.

As an integral part of General Dynamics Corporation's program of pioneering in Nuclear Fields, CONVAIR'S activities afford inviting opportunities for engineers and physicists to enter into Nuclear Development at its most advantageous stage.

CONVAIR'S Nuclear Program offers highly rewarding career opportunities both by way of professional accomplishment and personal income. A company-sponsored, in-plant program enables candidates to earn graduate degrees in Nuclear Engineering.

Fort Worth in the Great Southwest has an abundance of sunshine and dry, fresh air conducive to outdoor living and recreation. Within a few minutes drive of Fort Worth are seven large lakes which provide ample facilities for fishing and other water sports.

For further details write M. L. TAYLOR
CONVAIR Engineering Personnel Dept. RR
Fort Worth, Texas

CONVAIR
FORT WORTH

C O N V A I R

A DIVISION OF GENERAL DYNAMICS CORPORATION

FORT WORTH, TEXAS

WHO'S WHERE

(*Continued from page 9*)

Arthur Settel, U. S. public relations director for KLM Royal Dutch Airlines.

Lyn Malin, sales and publicity representative at Sydney, Australia for United Air Lines.

L. K. Lee, technical advisor of engineering research and development dept. of Mechanical Div. of General Mills, Inc. Other changes: **George H. Geick**, asst. manager of systems analysis; **Dr. Otmar M. Stuetzer**, chief of electron physics laboratory.

Arthur H. Zink, purchasing agent of Teletronics Laboratory, Inc., Westbury, L. I., N. Y.

Philip W. McLane, chief engineer of Fletcher Aviation Corp. Other changes: **Lloyd H. Swanson**, director of engineering personnel; **Robert S. Ricketts**, master production planning; **Howard Cordell**, personnel manager; **Stanley Christensen**, contract administrator; **Todd Derlachter**, comptroller; **Murray E. Liebman**, statistical quality control, **Raymond G. Brewer**, assistant to the president; **Herbert C. Parker**, consulting engineer of Washington, D. C. office; **George S. Kaibel**, Dayton office representative.

Martin W. Rogers, director of quality control of National Co., Inc.

George Shevlin, public relations director of Kawneer Co.; **W. J. Woodruff**, general manager of Appliance Products Div.

Robert W. Matlock, chief engineer of Zenith Aircraft, Div. of Zenith Plastics Co., Gardena, Calif.

Robert M. Van Tassel, chief industrial designer for Joy Manufacturing Co., Pittsburgh, Pa.; **William C. Russell**, general manager of the St. Louis Div.

Joe Egy, sales manager of Cline Electric Manufacturing Company's Aircraft Products Div.

Stanley Johns, St. Louis district sales manager of J. B. Ford Div. of Wyandotte Chemicals Corp. **George C. Prziborowski**, industrial sales, San Francisco district office of Wyandotte Chemicals Corp.

Ralph Cokeley, military aircraft hydraulic systems representative at Wright Field for Vickers Inc.

Peter Maler, sales promotion manager of Astron Corp., E. Newark, N. J.

Frederick A. Winzer, Jr., general sales manager of The Weatherhead Co., Aviation Div., Antwerp, Ohio.

W. H. Collins, Northeastern District sales manager for Trent Tube Co.

Walter W. Armstead, Jr., Indianapolis sales office of Allegheny Ludlum Steel Corp.; **Neale Carter**, Birmingham district sales office.

A. S. Chivers, sales manager of Barry Controls Inc., Watertown, Mass.

John W. Becker, Syracuse district sales manager of Allis-Chalmers Mfg. Co.

Bernard Goldman, liaison engineer & editor of Ford Instrument Co., Div. of Sperry Rand Corp.

Wayne S. Blackman, chief application engineer of American Electronic Mfg., Inc., Culver City, Calif.

Bert G. Maynard, resident engineer, Republic Aviation Corp. at Servel, Inc.

Paul L. Van de Velde, operations manager at Idlewild for Airwork Atlantic Ltd.

NATIONAL COVERAGE

EMPLOYMENT OPPORTUNITIES

The Advertisements in this section include all employment opportunities—executive, management, technical, selling, office, skilled, manual, etc.

Positions Vacant | **Civil Service Opportunities** | **Employment Agencies**
Positions Wanted | **Selling Opportunities Wanted** | **Employment Services**
Part Time Work | **Selling Opportunities Offered** | **Labor Bureaus**

DISPLAYED —RATES— **UNDISPLAYED**

The advertising rate is $23.35 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.

An Advertising inch is measured ⅞" vertically on a column—3 columns—30 inches to a page.

Subject to Agency Commission.

$1.80 per line, minimum 3 lines. To figure advance payment count 5 average words as a line.

Box Numbers—counts as 1 line.

Discount of 10% if full payment is made in advance for 4 consecutive insertions.

Not subject to Agency Commission.

Send NEW ADS to AVIATION WEEK, 330 W. 42nd St., N. Y. 36, N. Y., for November 7th issue closing October 28th

LOCKHEED AIRCRAFT CORPORATION
GEORGIA DIVISION

Has openings in the following classifications:

FIELD SERVICE REPRESENTATIVE

An opportunity awaits you in Field Service if you are under 40 years of age with previous field service experience and are willing to travel. Please include a recent photograph with your resume.

SENIOR PRICE ESTIMATOR

Requires ability to read and visualize shop operations from blueprints and a working knowledge of accounting statistics and material procurement.

Write in complete confidence

Dept. FS-1024
761 Peachtree St., N.E.
Atlanta, Georgia

LOCKHEED AIRCRAFT CORPORATION

REPLIES (Box No.): Address to office nearest you
NEW YORK: 330 W. 42nd St. (36)
CHICAGO: 520 N. Michigan Ave. (11)
SAN FRANCISCO: 68 Post St. (4)
LOS ANGELES: 1111 Wilshire Blvd. (17)

POSITIONS VACANT

Chief Engineer: Exceptional position open for graduate mechanical engineer, age 35-45, as head of an engineering department for company in compressed gas industry. Five to ten years experience required in product design and product engineering involving manufacture of pressure regulating equipment and flow control apparatus. Previous experience in organizing and managing an engineering department is preferred. This is a top position with a long established firm in the midwest manufacturing and distributing on a national basis products used by hospitals and the aviation industry. Salary open. Will pay interview expenses. Please state education, positions held, availability and salary desired. Replies confidential. Box P-7969, Aviation Week.

Your Inquiries to Advertisers Will Have Special Value . . .

—for you—the advertiser—and the publisher, if you mention this publication. Advertisers value highly this evidence of the publication you read. Satisfied advertisers enable the publisher to secure more advertisers and—more advertisers mean more information or more products or better service—more value—to YOU.

POSITIONS VACANT

A desirable position, drawing over $900.00 monthly, will be offered the first individual to submit conclusive proof that hovering can not be accomplished with channel wings using applied dynamic airflow pressure differentials. (the duct-collapsing force of jet air intakes) Submit: Aerophysics Independent Research Consulting, Box 105, Valdosta, Georgia.

POSITIONS WANTED

Pilot ATR—4000 hrs. 1st pilot multi engine. Scheduled air line experience, executive experience. College equivalent education. Now crop dusting. Prefer corporation type flying. 2369 Longstreet Drive, Memphis, Tenn.

Industrial Salesman seeking product of reliable US manufacturer for coverage Western New York area. Excellent sales and technical background. Age 35. PW-8004, Aviation Week.

Executive Pilot, 38, experience Convair, DC-4, DC-6B, Connies. Ex-KLM Captain. 9500 hrs. 10 yrs. airline, 5 yrs. U. S. Navy. Univ. Grad., knowledge French, Spanish. PW-8061, Aviation Week.

SELLING OPPORTUNITY OFFERED

Technical sales representative desires new line. Now successfully contacting aircraft and industrial accounts in Southwest and Midwest. Experienced in electronics; powerplant and mechanical accessories. Extensive background in aviation sales and sales management. Experienced pilot. Will consider full time or part time lines. RA-8042, Aviation Week.

ENGINEER

NORTH AMERICAN'S Electro-Mechanical (Controls) Dept.

OFFER

• Top salaries • Maximum employee benefits • Wider scope for your ability • Challenging design and development work with NAA's top engineers •

SPECIAL LONG-RANGE PROJECT OPPORTUNITIES FOR

Automatic Controls Engrs.

Design of advanced transistor circuits and hydraulic valves as applied to computers and servo-mechanisms. Varied interesting project work for well-rounded experienced applicants.

Special Machines Designers

Aircraft experience not essential for design work on experimental sandwich production machines. 2 years engineering training and 5 years design and drafting experience required.

NEW GROUP FORMATION OFFERS SPECIAL OPENINGS

Senior Electro-Mechanical Engineers

Top experience with prime interest in experimental research.

Electro-Mechanical Engineers

Research Engineers

Inertial and Electronics Systems

Electronics, Mechanical Engrs. Physicists, Mathematicians

with experience in Fire or Flight Control Systems or in servomechanisms, kinematics, dynamics, digital, transistorized, analog computers and gyroscopes.

Instrumentation Engineers

for Flight Control System

Contact
Box A-C1
Engineering Personnel
Department 9120
12214 Lakewood Blvd.
Downey, California

NORTH AMERICAN AVIATION

Radical Research in progress in all 4 basic types of Missile Systems
AIR TO AIR
AIR TO GROUND
GROUND TO AIR
GROUND TO GROUND

Discovery and Opportunity

GO HAND IN HAND AT REPUBLIC'S GUIDED MISSILES DIVISION

The design and development of Guided Missiles is still in its infancy. The future holds the possibility of many new and revolutionary developments. *You can share in this future at Republic,* where expert engineers and scientists are playing an ever more important role in the vital new field of "push-button" weapon systems. Opportunities for an inventive man to grow in professional standing, with commensurate financial rewards, are exceptional.

POSITIONS OPEN AT ALL LEVELS IN:

Aerodynamics	Technical Writing	Electromechanics
Systems	Stress	Preliminary Design
Design	Controls	*(Weapons System Proposals)*
Dynamics	Electronics	

If you are interested in joining this pioneering organization, write Mr. R. Reissig, Administrative Engineer or call Wells 1-2373. (Please furnish detailed resume of background and experience.)

RELOCATION EXPENSES PAID...LIBERAL BENEFITS

Interview expenses are paid, for qualified candidates, living outside the New York City and Long Island area. Actual and reasonable insured costs of moving household and personal effects; free-storage up to 30 days, where necessary; $10 per diem up to 30 days, while getting settled.

And every engineer enjoys a top salary scale at Republic plus company-paid life, health and accident insurance up to $20,000; hospital-surgical benefits for the whole family; ¾ of the cost of your collegiate and graduate study.

GUIDED MISSILES DIVISION

REPUBLIC AVIATION CORP. • Hicksville, Long Island, New York

LIVING ON LONG ISLAND...a pleasant adjunct to a Republic job. Ideal suburban communities, fabulous beaches, state parks.

ENGINEERS

CAREER OPPORTUNITY

Our STAFF RESEARCH & DEVELOPMENT DEPARTMENT needs mechanical and aeronautical engineers interested and experienced in turbo-jet engine components, afterburners, variable area exhaust nozzles and thrust reversers.

Address inquiries to Manager of Technical Placement

THOMPSON PRODUCTS, INC.

6410 Cedar Avenue **Cleveland 3, Ohio**

"A Major Supplier to America's Jet Engine Builders"

LOCKHEED AIRCRAFT CORPORATION

Georgia Division

Has immediate openings for

FLIGHT TEST INSTRUMENTATION TECHNICIANS

Minimum 1 year aircraft experience required with experience in the use of one or more of the following:

1. Recording Oscillographs
2. Recording Potentiometers
3. Oscilloscopes
4. Telemetering Equipment
5. Instrument Repair Equipment
6. Strain Gauge Application

Write in complete confidence

Dept. FI-1024

LOCKHEED AIRCRAFT CORPORATION

761 Peachtree St., N.E.
Atlanta, Georgia

ENGINEERS

THE APPLIED PHYSICS LABORATORY OF THE JOHNS HOPKINS UNIVERSITY offers an exceptional opportunity for professional advancement in a well-established Laboratory with a reputation for the encouragement of individual responsibility and self-direction.

Our program of

GUIDED MISSILE RESEARCH and DEVELOPMENT

provides such an opportunity for men in:

SUPERSONIC MISSILE DESIGN
WIND TUNNEL TESTS AND DATA ANALYSIS
RAMJET DESIGN AND ANALYSIS
MISSILE SYSTEMS DEVELOPMENT
DESIGN AND LAYOUT OF MISSILE COMPONENTS
RESEARCH AND ANALYSIS IN AERODYNAMIC STABILITY & CONTROL

Please send resume to:
Professional Staff Appointments

APPLIED PHYSICS LABORATORY
THE JOHNS HOPKINS UNIVERSITY
8615 Georgia Avenue
Silver Spring, Maryland

DIVERSIFIED

ELECTRONICS ENGINEERING HIGHLIGHTS

YOUR PROGRESS AT RCA!

LOCKHEED P2V

CONVAIR	F-102
McDONNELL	F-101
LOCKHEED	P2V
LOCKHEED	F-94
LOCKHEED	WV2
PIASECKI	H-21
LOCKHEED	C-121
DOUGLAS	C-124

Plus other important aircraft being delivered to U.S. Armed Forces

Electronic systems and equipments designed and developed by RCA engineers make vital contributions to successful performance of these aircraft in:

NAVIGATION
PRECISION BOMBING
COMMUNICATIONS
FIRE CONTROL

PIASECKI H-21

You should have a Bachelor or Advanced Degree in EE, ME or Physics; plus two years electronics design and development experience. Managerial positions also open.

RCA opens opportunity for *you* to join the engineering team responsible for this high level of achievement. You can progress with RCA as it continues the advance of aviation in so many challenging areas!

McDONNELL F-101

You'll locate in Greater Philadelphia or Boston area. Broad, liberal RCA benefits. Relocation assistance.

Please send complete resume of education and experience to: **Mr. John R. Weld, Employment Manager**
Dept. B-2K, Radio Corporation of America
Camden 2, New Jersey

RCA

RADIO CORPORATION OF AMERICA
ENGINEERING PRODUCTS DIVISION

Bendix needs ELECTRONIC and MECHANICAL ENGINEERS in SOUTHERN CALIFORNIA

Unusual engineering positions in electrical and mechanical design of radar, sonar and telemetering are available. These positions, which are directly associated with our long-range projects for industry and for defense, are available at all levels.

Now nearing completion at Bendix-Pacific is the new Engineering Center. With more than 100,000 square feet of area it represents the latest and one of the most complete engineering facilities in the nation.

You are invited to consider becoming a member of this vital engineering group — with a forward looking company in Southern California.

Please fill in the coupon or write us for complete information.

W. C. Walker, Engineering Employment Manager
Pacific Division, Bendix Aviation Corp.
11600 Sherman Way, North Hollywood, Calif.

Please send information.
I am a graduate engineer with_____degree.
I am not a graduate engineer but have_____ years experience.

Name_____

Address_____

City_____ Zone____ State_____

There's a future in

CONTROLS BY HONEYWELL

THIS is the age of automatic control. And automatic control is Honeywell's business. A pioneer and leader in the aircraft control field, Minneapolis-Honeywell has produced more autopilots than any other company. Honeywell manufactures other systems and products so highly diversified that you are promised exciting opportunities for creative achievements and personal advancement. Constantly expanding research and development of new concepts promise you unlimited possibilities for growth.

Consider these selective openings:

RESEARCH AND DEVELOPMENT:

Graduate engineers are needed in these related fields and product lines:

Autopilots	Gyros	Electronics	Applied Mechanics
Hydraulics	Nuclear Controls	Instrumentation	Thermodynamics
Aircraft Dynamics	Servomechanisms	Inertial Guidance	Systems Engineering

Production Engineers

Openings for engineers with 5 years experience, including process planning on new products. Thorough knowledge of tooling, estimating, metals fabrication, manufacturing and assembly operations. Experience must have been on products such as precision mechanical, electrical or hydraulic equipment, electromechanical controls, electric motors, instruments, or gyros.

And consider these advantages:

Ideal suburban living in friendly, uncrowded Minneapolis, famous for cultural activities and recreational facilities.

Generous employee benefits include broad company-paid insurance and pension plans, liberal tuition allowances for advanced study.

Travel and family moving expenses paid.

Please send résumé of your background including salary requirements, to

J. A. Hill — Engineering Placement Manager
Minneapolis-Honeywell Regulator Company
2753 4th Ave. South, Minneapolis 8, Minn.

LOCKHEED AIRCRAFT CORPORATION
GEORGIA DIVISION
Has opening for

INSTRUCTOR - AIRCRAFT ELECTRICAL

Thorough knowledge of maintenance and operation of modern electronic equipment in aircraft required. Five years experience in practical electrical maintenance and electrical instruction.

Write in complete confidence
Dept. IAE-10-14
761 Peachtree Street, N.E.
Atlanta, Georgia

LOCKHEED AIRCRAFT CORPORATION

SPECIFIC ENGINEERING OPENINGS AT CESSNA

Aerodynamics Engineer
Aerothermodynamicist
Dynamics Engineer
Weight Control Supervisor
Structural Analysis Engineer
Structural Design Engineer
Mechanical Design Engineer
Jr. Administrative Engineer

For Further Information Contact
Technical Placement Supervisor

CESSNA AIRCRAFT COMPANY
Wichita, Kansas

Lockheed diversification in action...

Below: engineers and scientists work on some of the 46 major projects in progress at Lockheed

Operations Research discussion on continental defense

Operations Research openings

Electronics Specialists
Fire Control and Guidance Specialists
Aerodynamics Engineers
Physicists

Fatigue test on Super Constellation skin

Structural Engineering openings

Research Specialists
Structures Engineers
Stress Analysts
Weight Engineers

Hot-air cyclic de-icing test on radar search plane

Thermodynamics openings

Research Specialists
Thermodynamics Engineers
Thermodynamicists

Design study on hydraulic requirements of new transport

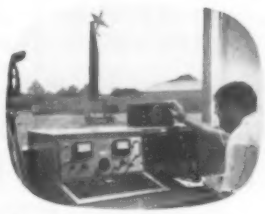
Design openings

Design positions are open at all levels in controls, electrical, hydraulics, mechanical, power plant and structures fields.

IBM 701 applied to jet transport flutter problem

Math. Analysis openings

Math. Engineers
Math. Specialists
Math. Analysts



Antenna pattern study on radar search planes

Electronics openings

Electronics Research Engineers
Airborne Antenna Designers
Research Specialists

In-flight test on air speed performance

Flight Test Engineering openings

Flight Test Engineers
Flight Test Analysts
Instrumentation Engineers
Electrical Research Engineers

Aerodynamic meeting on high-speed fighter

Aerodynamics openings

Aerodynamics Engineers
Aerodynamicists
Dynamics Engineers
Wind Tunnel Test Engineers

Why Lockheed offers Engineers better careers

There are three main reasons:

1. More opportunity for promotion
because there are more supervisory positions to be filled with 46 major projects underway, including 13 models of aircraft on assembly lines.

2. More career security
because Lockheed activities cover virtually the entire spectrum of aeronautical endeavor.

3. Life in Southern California
Scenic beauty, unmatched climate, wide recreational opportunities enhance life in the San Fernando Valley.

Lockheed offers engineers increased salary and overtime benefits and generous travel and moving allowances that enable you and your family to move to Lockheed at virtually no expense.

Coupon below is for your convenience in requesting application form and more information on how Lockheed's expanding program can advance your career.

E. W. Des Lauriers, Dept. C-3-10

Lockheed AIRCRAFT CORPORATION
CALIFORNIA DIVISION • BURBANK
California

Please send me a brochure describing life and work at Lockheed and an application form.

Name

Field of Engineering

Street Address

Phone

City and State

GENERAL MOTORS

Invites You . . .

ENGINEERS DESIGNERS NEEDED!

G.M. ELECTRONICS DIVISION
offers challenging, pioneering opportunities to ambitious men. We extend a cordial invitation to every deserving Engineer and Designer to write us their wants. We may be able to supply the square hole for the square peg!

CREATIVE OPPORTUNITIES
in the following fields: Missile Guidance Systems; Jet and Turbo Prop Engine Controls; Bombing and Navigational Computer Systems; Airborne Fire Control; U.H.F. Communications, MICROWAVE EQUIPMENT, etc.

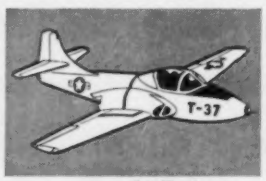
YOUR FUTURE
depends on your making the right connection with the right firm as quickly as possible. Why not send full facts about your education, work background, etc. We will do all we can for you and treat it with the fullest confidence.

AC SPARK PLUG • THE ELECTRONICS DIVISION
GENERAL MOTORS CORPORATION
MILWAUKEE 2, WISCONSIN

Business flying growth creates need for Engineers at Cessna

Demand for business airplanes plus Cessna developments in military aviation provide big opportunities for creative engineers.

Helicopter



Jet Trainer

Cessna 620

Cessna 310

Cessna 180

Cessna 170

For a brighter future join successful Cessna

Cessna offers competitive salaries; job stability; flying clubs; and the convenience of living within 15 minutes of work in a friendly city. MOST IMPORTANT, Cessna offers individual recognition, and new opportunities in both civil and military aviation. At Cessna, you are an important person. You will enjoy working here and you will be given every opportunity to grow.

Cessna

WRITE. *Cessna Aircraft Company, Dept. AWP-23, Wichita, Kansas. State experience and qualifications.*

NUCLEAR AIRCRAFT POWERPLANT CONTROLS

ENGINEER

This is an unusual opportunity for a Project Engineer who can assume full responsibility for developing controls for a nuclear-powered aircraft engine.

To qualify, you must have 10 to 15 years of pertinent experience. This must include 5 to 7 years' development or analytical work on aircraft powerplant control systems.

At least a B.S. degree is required from an accredited college. Degree must be in Mechanical, Electrical or Aeronautical Engineering.

The man selected will have unequalled facilities at his disposal, for this opening is in the engineering department of Pratt & Whitney Aircraft — world's largest designer and builder of aircraft engines.

Attractive salary and employee benefits. Good schools and excellent living conditions in pleasant upper Connecticut.

Please send complete resume covering education, experience and accomplishments to Employment Supervisor.

PRATT & WHITNEY AIRCRAFT
DIVISION OF UNITED AIRCRAFT CORP.
EAST HARTFORD 8, CONNECTICUT

There is a case for Changing Jobs . . .

MANY highly qualified technical men find that the work available to them in their present assignment does not give them the opportunity to make greatest use of the skills and knowledge acquired through years of work and study.

When a man reaches this point in his development, there are two courses open to him. He can be reassigned or he can change employers to a position that will give him more room to grow.

If a transfer seems unlikely in your case, it may be to your advantage to consider the alternative and investigate the exceptional openings available to qualified engineers. At Chance Vought, for example, you will find a medium sized engineering organization with the most modern facilities and creative engineering assignments available in the newest phases of aeronautical research and design of fighter aircraft and guided missiles.

Currently Chance Vought is producing the world's fastest Navy fighter the F8U-1 "Crusader" and the guided missile "Regulus". Further development of these as well as other classified projects assures qualified men of outstanding personal opportunities. For a full evaluation of the future open to you at Chance Vought, investigate these opportunities today.

●

Openings exist at present in

AIRFRAME DESIGN
(Fuselage, Wing and Tail)

PROPULSION ANALYSIS
(Installed Engine Performance, Heat Transfer, Duct Design)

MECHANICAL DESIGN
(Equipment and Engine Installation, Electrical and Hydraulics Systems, Landing Gear, Controls, and Armament)

ELECTRONICS SYSTEMS DESIGN
(Automatic Controls and Guidance, Advanced Systems Development, Reliability and Packaging)

STRUCTURES
(Stress Analysis, Testing, Materials, Metallurgy)

FLIGHT TEST
(Planning, Operation, Analysis and Instrumentation)

To arrange for a personal, confidential interview

WRITE
Engineering Personnel

CHANCE VOUGHT AIRCRAFT
INCORPORATED

P. O. Box 5907 • Dallas, Texas

LOCKHEED AIRCRAFT CORPORATION
GEORGIA DIVISION

Has immediate openings for

MATERIALS & PROCESSES ENGINEERS

Minimum 5 years experience in aircraft or allied fields in fabrication, design and materials specification preparation and revisions. Engineering degree required. Work involves contacts with Engineering and Manufacturing personnel. Special consideration given to applicants with nuclear experience.

PRODUCTION DESIGN ENGINEERS

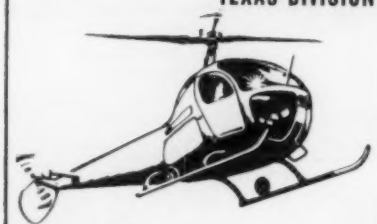
Minimum 10 years experience in aircraft or allied fields of design and fabrication of parts and equipment with emphasis on cost reduction. Work includes review and approval, for producibility, of project drawings and contacts with Manufacturing personnel on fabrication and assembly problems. Special consideration given to applicants with practical experience on nuclear projects.

Write in complete confidence
Dept. MP-1024
761 Peachtree St., N.E.
Atlanta, Georgia

LOCKHEED AIRCRAFT CORPORATION

BELL *Aircraft* CORP.

TEXAS DIVISION



Openings for:

ENGINEERS:

MECHANICAL
ELECTRICAL
AERODYNAMICISTS
DYNAMICISTS
WEIGHTS
SERVO
STRESS

ENGINEERING PERSONNEL
BELL AIRCRAFT CORP.
FORT WORTH, TEXAS

Structures Engineers

Martin offers opportunities in the following fields:

STRESS ANALYSIS
AEROELASTICITY
BONDED STRUCTURES
THERMAL STRESS

Please submit confidential resume to J. M. Hollyday, The Martin Co., Baltimore 3, Md.

MARTIN
BALTIMORE

OUTSTANDING ENGINEERING OPPORTUNITY

Are you a specialist or a recent graduate proficient or interested in one or more of the following fields?

- **Aero-Thermodynamics**
- **Internal Aerodynamics**
- **External Aerodynamics**
- **Ballistics**
- **Ram Jet and Turbo Jet Test and Performance**
- **Transonic and Supersonic Design and Test Operations**
- **Turbine and Compressor Design**

Sverdrup & Parcel, Inc. is engaged both nationally and internationally in design and consultation of advanced and unusual areonautical test facilities which require the theory and application of these special fields. The wide variety of our work, embracing the design and review of industrial development facilities, offers challenging problems and provides excellent opportunity for individual development and advancement.

Starting salary and extent of responsibility are dependent upon individualy ability and experience. Fringe benefits include: an unusually attractive Employee Benefit Plan which furnishes insurance features and provides for retirement; paid vacations, holidays and sick leave; overtime rates; and an employees' club which offers interesting social and practical values. Two accredited universities offer opportunity for advanced education.

Your letter of inquiry will receive prompt attention and reply. Please write to—

SVERDRUP & PARCEL, Inc.
Consulting Engineers
915 Olive St. Louis 1, Mo.

EMPLOYMENT OPPORTUNITIES

(Continued from opposite page)

SEARCHLIGHT SECTION

(Classified Advertising)

BUSINESS OPPORTUNITIES — EQUIPMENT - USED or RESALE

UNDISPLAYED —RATES— **DISPLAYED**

$1.80 a line, minimum 3 lines To figure advance payment count 5 average words as a line.
Box Numbers count as one line.
Discount of 10% if full payment is made in advance for 4 consecutive insertions.

The advertising rate is $18.00 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.
An advertising inch is measured ⅞" vertically on one column, 3 columns, 30 inches to a page.

Closing Date: 10 days before issue date, subject to space limitations.

quality control
SYSTEMS ENGINEERING
component design
ENVIRONMENTAL ENGINEERING
coordination
ADMINISTRATION
RESEARCH
production engineering
DEVELOPMENT
packaging

Regardless of which is your ultimate objective the broad practical experience you get in FIELD ENGINEERING will supplement your theoretical training, prepare you to meet the challenge of the future and put you years ahead!

RAYTHEON FIELD ENGINEERING

is diversified. Radar, Sonar, Guided Missiles, Computers, Microwave and other specialized equipments offer an outstanding opportunity to qualified men to earn excellent salaries while working among authorities in these fields. Your performance regulates your progress. Liberal insurance and retirement plans. Generous travel allowances and other benefits. Grow with a growing organization. Write now:

RAYTHEON MFG. CO.
Government Service Department
100 River Street
Waltham 54, Massachusetts

ENGINEER

MISSILE & WEAPONS CONTROL SYSTEMS STUDIES

Enjoy full use of your skill and imagination, and friendly, professional give and take with top men in the field of electrochemical precision equipment.

You will perform studies related to airborne weapons control and guidance systems with the object of determining requirements, feasibility, performance and specifications of computers and over-all systems.

A degree in physics, ME or EE—or the equivalent in experience—is required. Must be able to handle problems in such diversified fields as: digital computers, digital data transmission systems, logic counting and conversion circuits, high precision gyro and gimbal structures, dynamic behavior of missiles, alignment of inertial platforms for guidance systems, and flight evaluation of guidance systems and instrumentation. Send resume in confidence to:

Technical Personnel Dept. 2-500

ARMA

Division American Bosch Arma Corp.
Roosevelt Field, Garden City
Long Island, N. Y.

How much power will SUPER-92 pull for how long?

There's PROOF in PERFORMANCE *and* KNOWLEDGE in EXPERIENCE

and here are some performance facts from pilots who have typical experience with Super-92 engines.

Names on Request	Hours	@ HP	Gas Gls hr	Oil Qts hr	Replaced with
A	992	650	47	3	Super-92
B	955	650–675	50	2	Super-92
C	951	655–680	51	1½	Super-92
D	900	650	50–52	3	Super-92
E	900	680	50	2	Super-92
F	871	690	50.5	1	Super-92
G	860	675	50	2–3	Super-92
H	740	600	48	2	Super-92
I	670	660	52.5	1–2	Super-92

If you want to know about the Super-92, ask the pilots who fly them. After all, what manufacturer or dealer will "approve" a competitive product he cannot supply himself*, or state other than "opposition" when asked about it? (Do the Giants "approve" the Dodgers?)

SUPER-92 engines are

***Guaranteed* for 800 hours prorata**
***Guaranteed* for 200 mph or more in DC3**
***Guaranteed* for maximum overhaul costs**
***Guaranteed* for parts and exchange availability**
Immediately and easily interchangeable with R1830-92

*Engine Works stocks and installs ALL engines approved for DC3, including

Super-92
R1830-75, -94, -92
R1820-56, -72, -76, -202, -205
R2000

Engine Works
Lambert Field
St. Louis, Mo.

BEECHCRAFT TWIN BONANZA

137 hrs. 45 min. Total Time since New. $11,000, radio installation. Being completely majored to Zero time on everything. Exterior Blue and White. Sale or lease. Will finance or trade.

AIRLINE EQUIPMENT CORPORATION
Newark Airport
Market 2-0963 **Newark, N. J.**

Immediate Delivery

We stock, overhaul and install

WRIGHT R1820 —202, —56, —72

PRATT & WHITNEY R1830 —75, —92, —94

R2000 R1340 R985

and our most popular DC3 engine R1830 - SUPER - 92

ENGINE WORKS

Lambert Field Inc. St. Louis, Mo.

Deal Directly with Owner

No deposit required—no long-term contract.

- Executive appointments
- Well equipped radio
- Full instrumentation
- Good selection

C18 and D18 BEECHCRAFT FOR LEASE

$800 monthly and up. Fly all you like. Aircraft hull insurance included. If desired aircraft available for outright purchase

TRADE-AYER COMPANY

Linden Airport Linden, N. J.

Hunter 6-7690

C-46-F AIRCRAFT

Cargo configuration remanufactured engines.

"O" props, "O" instruments. Complete Deicing system. Certified airlines radio equipment, every modification compliance, 48,000 lbs gross take off weight. Pass for new condition and performance. Sale or lease arrangement.

Call owner, Miami, Florida 64-5123 or write P. O. Box #217 Miami Springs, Florida.

---

2 C-46F Type Aircraft

Available for long term lease or lease purchase arrangement.

Zero time, passenger or freight. Hamilton Standard props, full de-icing equipment, modified to 48,000 lbs. gross take-off weight.

International Aircraft Maintenance Co.

Lockheed Air Terminal, Burbank, Calif.

STanley 7-5378

! ! BELIEVE IT — OR NOT ! !

A Trimotored Cargo-Northrop

A revolutionary and fantastic 20 ton aircraft with Cub performance in and out of pastures and improvised landing strips with 3 engine safety factor. Depending on load and wind, takeoff distance 250' to 1850'; landing 450' to 650'; climb 700' to 1350' per min.; cruise 165 mph; top 201 mph; stall 69 mph; range 2000 mi.; empty weight 25,000 lbs.; gross 38,000 lbs. with Wright 1820-99 1200 H.P. engines. With 1820-56A engines gross increases to 42,000 lbs.

Built by Northrop in 1950 for Arctic Rescue and Assault Transport to replace gliders but with ability to take off in short distances.

Rear loading power operated drive-in ramp for trucks, bulldozers, etc. Passenger conversion 30-40 passengers. Provisions for dual wheels for plowed field takeoff and landing, also fittings for skis. Landing gear fixed for low maintenance. Engine change 45 min. max. Designed for minimum of maintenance & operating cost and rugged construction.

AIRFRAME TIME SINCE NEW AVERAGE 35 HOURS

FOR SALE OR LEASE

Frank Ambrose Aviation Co., Inc.

P. O. Box 181 - International Airport Branch

5383 N.W. 36th Street - Phones: 88-2464, JE 1-7225

MIAMI 48, FLORIDA

FOR SALE

Cracked twin bonanza, less than 200 hours total time. Fully equipped. Less than $7500. damage. No reasonable offer refused. FS-8002, Aviation Week.

WANTED

AIRPLANES WANTED

Need 50 Bonanzas, Navions, 180's, 190's, 170's, Aero Commanders, Twin Navions, Twin Beeches, etc.

Will Buy Dealers' Stocks New or Used

Vest Aircraft Co.'s Skyranch

BOX 5306, DENVER 17, COLORADO

We Buy DC-3 and C-47

—also components, fuselages, center sections. Prefer runout or needing work, airline, passenger, or cargo, Pratt & Whitney or Wright. State price, time, quantity, type engines.

We are not brokers

REMMERT-WERNER, INC.

Lambert Field St. Louis, Mo.

SPECIAL SERVICES TO THE AVIATION INDUSTRY

PARTS & SUPPLIES

NAVCO INC. Lambert Field St. Louis, Mo. PErshing 1-1710

Has all Parts and Supplies for Executive DC-3 LODESTER BEECH

Airframe Engines Radios

A.R.C. Bendix Collins Lear Sperry Wilcox

P&W Continental Wright Goodrich Goodyear

OVERHAUL & MAINTENANCE

REMMERT-WERNER, Inc.

Lambert Field St. Louis, Mo.

offer your choice of

1 DAY 100 hour INSPECTIONS OR 2 DAY for BEECHCRAFT DC-3 OR 3 DAY 100 hour OVERHAULS LODESTAR

AIRCRAFT DEALERS

PERSONAL and EXECUTIVE AIRCRAFT

Buy — Sell — Trade — Finance

INQUIRE FOR FREE LIST

GRAUBART AVIATION

679 N. Michigan, Chicago, MOhawk 4-7190

"WE OWN THE AIRCRAFT WE SELL"

EXECUTIVE & AIRLINE AIRCRAFT LEASES, SALES & FINANCING

Also since 1923 the oldest and largest aircraft dealers with largest stock parts for P&W, WAC, HS, Douglas, etc., and accessories.

Frank Ambrose Aviation Co., Inc.

P. O. Box 181, Miami Int'l Airport

Phone 88-2464 Miami 48, Florida

RENDER A SERVICE?

Write for rates.

FOR RATES OR INFORMATION About Classified Advertising

Contact The McGraw-Hill Office Nearest you.

ATLANTA, 3
1321 Rhodes-Haverty Bldg.
WAlnut 5778
W. LANIER

BOSTON, 16
350 Park Square
HUbbard 2-7160
P. McPHERSON

CHICAGO, 11
520 No. Michigan Ave.
MOhawk 4-5800
H. BOZARTH
W. HIGGENS

CLEVELAND, 15
1510 Hanna Bldg.
SUperior 1-7000
C. J. LOUGHLIN

DALLAS, 2
Adolphus Tower
Main & Akard Sts.
PRospect 5064
J. CASH

DETROIT, 26
856 Penobscot Bldg.
WOodward 2-1793
L. SEEGAR

LOS ANGELES, 17
1111 Wilshire Blvd.
MAdison 6-4323
G. JONES
G. McREYNOLDS

NEW YORK, 36
330 West 42 St.
LOngacre 4-3000
R. LAWLESS
W. SULLIVAN
D. COSTER

PHILADELPHIA, 3
17th & Sansom St.
RIttenhouse 6-0670
J. WILLIS

ST. LOUIS, 8
3615 Olive St.
LUcas 4867
H. BOZARTH

SAN FRANCISCO, 4
68 Post St.
DOuglas 2-4600
T. WYCKOFF

"Take a Heading for Reading"

FOR THE BEST

MAINTENANCE - OVERHAUL - MODIFICATION - INSTALLATION

READING AVIATION SERVICE, INC.

MUNICIPAL AIRPORT Phone 3-5255 READING, PENNSYLVANIA

Automation Creates Jobs For Workers With Skills

There is new and reassuring information for those who fear that "automation" – the control of machines by machines – will mean fewer job opportunities. It comes from a special survey of 1,574 companies in metalworking industries recently completed by AMERICAN MACHINIST, a McGraw-Hill publication. More than one-fifth of the companies reported that they already have automatic loading, transfer or assembly machinery in operation. In these companies as a whole there has been a net increase in total employment since this machinery was installed.

According to the AMERICAN MACHINIST survey, of these companies with actual experience in automation

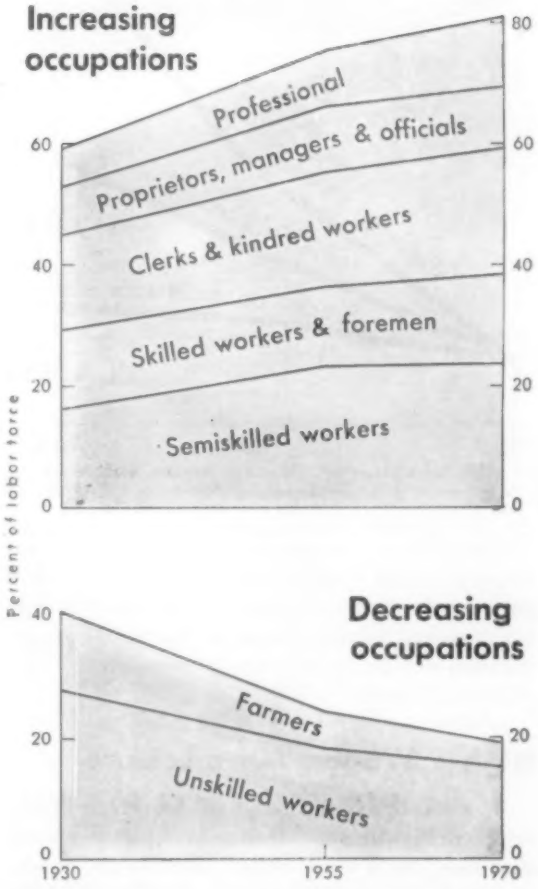
- 26% reported increases in employment averaging 21%
- 51% reported no change in total employment
- 23% reported decreases in employment averaging 16%

More Jobs for the Skilled

Of greater significance, however, is the response by 40% of these companies that they required more skilled maintenance men and by 21% of the companies that they had increased their engineering staffs. This indicates that automation is strengthening a trend already evident in the United States, a trend of expanding opportunity for those with industrial and professional skills and, relatively, of contracting opportunity for the unskilled.

The following chart shows how strong this trend has been over the past 25 years and how strong it may be expected to be over the next 15 years.

There has been a sharp decline in the percentage of unskilled workers in the nation's labor force and a corresponding increase in the percentage of those with varying degrees of skill.

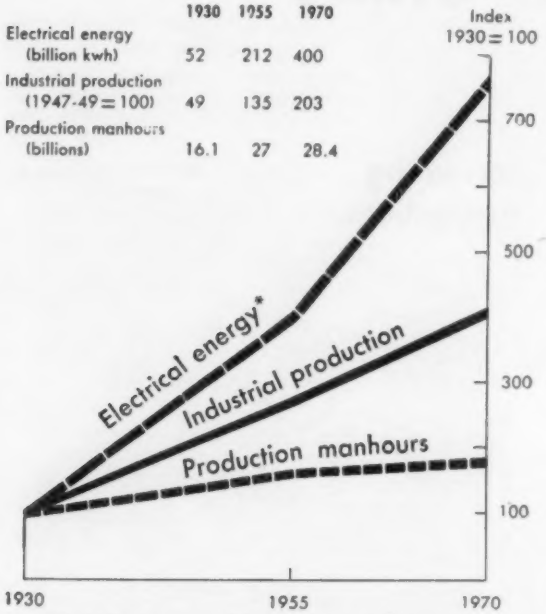


It is possible, of course, to cite cases of individuals and groups that do not conform to the charted trends. Farmers, for example, are becoming at the same time more skilled and less numerous. But this does not upset the broad proposition that opportunities are increasing for those who have skills.

Power and Production

Much of the basic explanation for the relative expansion of opportunities for those with industrial and professional skills lies in the increasing use of power-driven machinery. This has made possible a vastly greater increase in manufacturing production than in the manhours of human labor devoted to it. The following chart shows the relative increases in electrical energy and manhours of labor used in manufacturing since 1930 and the rise in industrial production.

	1930	1955	1970
Electrical energy (billion kwh)	52	212	400
Industrial production (1947-49 = 100)	49	135	203
Production manhours (billions)	16.1	27	28.4

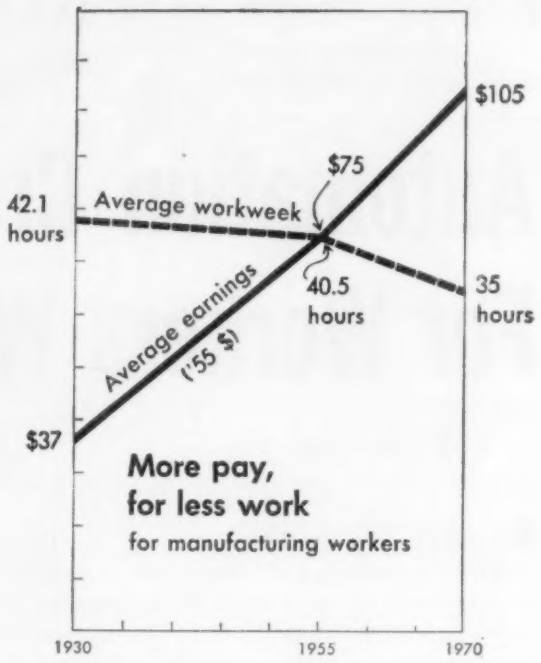


*Excludes power used in aluminum and magnesium reduction, both very heavy power users.

Power-driven machines have reduced the amount of human energy required for physical labor, but they have increased the need for skillful handling and maintenance. As the AMERICAN MACHINIST survey demonstrates, the same is true of automatically controlled machinery.

Higher Wages, More Leisure

The rising average wage of American industrial workers and the decline in hours per week that they must work reflect directly the extent to which the increase in industrial production has outstripped the manhours devoted to it. The final chart shows the increase in weekly wages (in dollars of constant purchasing power) and the decrease in the average workweek in manufacturing since 1930. It also shows the changes that may come in the next 15 years if present trends continue.



There are some who would slow what an earlier editorial in this series characterized as "the continuing process of taking dull and laborious work off the backs and minds of men and transferring it to machines operating in large batteries under automatic control." In doing so, they might make the world safer for those with no skill. The far more constructive course is to welcome the expanding opportunities now being provided and be sure that the nation's young people, who are now starting another school year, are prepared to take advantage of them.

This message is one of a series prepared by the McGraw-Hill Department of Economics to help increase public knowledge and understanding of important nationwide developments that are of particular concern to the business and professional community served by our industrial and technical publications.

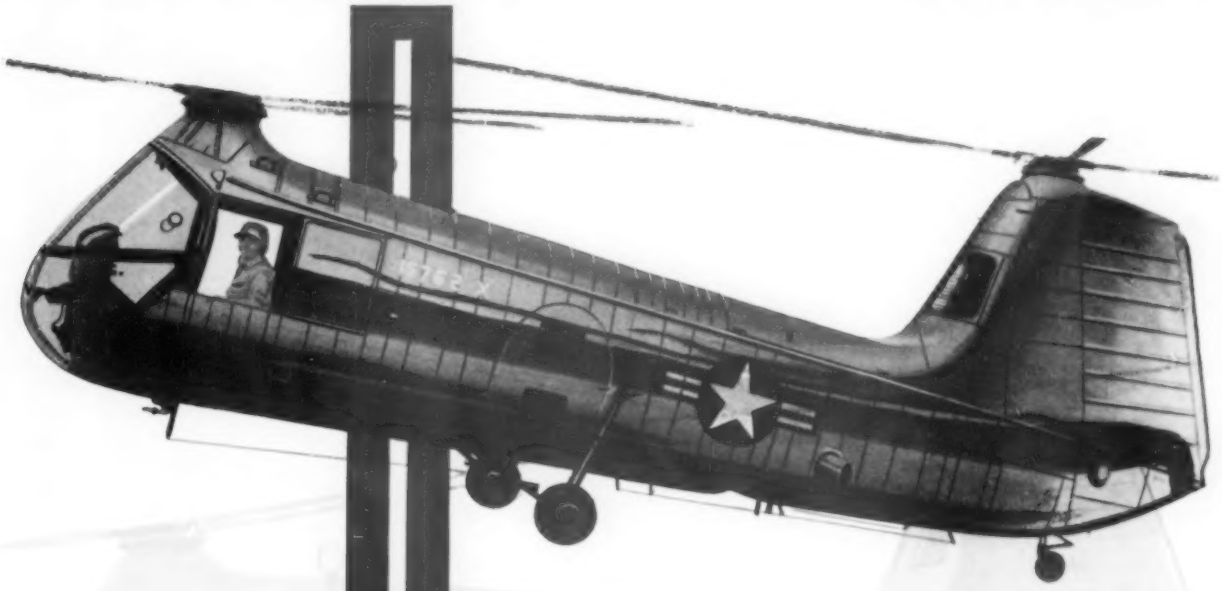
Permission is freely extended to newspapers, groups or individuals to quote or reprint all or parts of the text.

Donald C. McGraw

PRESIDENT

McGRAW-HILL PUBLISHING COMPANY, INC.

Everything's going up . . . except the temperature!



HARRISON KEEPS THE HEAT DOWN!

Heat's "grounded" for good when Harrison takes over the cooling job! And you'll find Harrison oil coolers on more 'copters than all other makes combined—keeping transmission and engine temperatures at just the *right* level for peak efficiency. In addition, Harrison oil coolers are designed to save space and weight—permitting 'copters to fly faster—farther—with bigger payloads! And Harrison's outstanding research facilities are constantly at work, developing the latest advances in heat exchangers. If you have a cooling problem, look to Harrison for the answer!

Harrison Radiator Division, General Motors Corp., Lockport, N.Y.

GM GENERAL MOTORS

HARRISON

TEMPERATURES MADE TO ORDER

Best for keeping inventories low because . . .

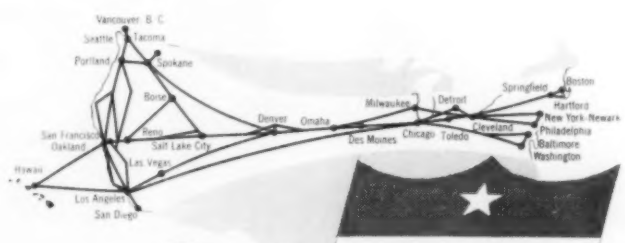
UNITED AIR LINES can guarantee Reserved Air Freight space

No longer do you have to maintain high-level, costly inventories at widespread points to meet distribution or production-line needs. United Air Lines – and only United – can provide guaranteed Reserved Air Freight space on *all* equipment, not only over its own routes, but worldwide through connecting airline agreements.

This modern, dependable way of shipping enables you to keep a tighter inventory control, reduce warehousing costs and eliminate production-line delays. It brings new economy and efficiency to practically every type of business.

United's Main Line Airway follows the bustling business belt across the nation. There are more than 254 Mainliner® flights daily, each carrying cargo, most offering Reserved Air Freight space. Whatever your business, whatever you ship, it will pay you to use United Air Lines Air Freight.

For speed, dependability and economy, learn the advantages of United Air Lines Air Freight Service. Call the nearest United representative or write for free booklet, "Industry's Flying Partner." Cargo Sales Dept., J-10, United Air Lines, 5959 S. Cicero Avenue, Chicago.



UNITED
AIR LINES

Obsolete Nav Aids Threaten Prosperity

IATA warned that outmoded navigation aids jeopardize international airlines' economic future.

By Craig Lewis

New York—Inadequate, outmoded navigation aids are costing international airlines heavily and threaten the economic future of the industry, an International Air Transport Association technical committee warned here last week.

The state of navigation aids and ground organization on which the airlines depend lags five years behind current aircraft development, the Technical Committee report before the annual general meeting of IATA declared. It added:

"We operate our aircraft with exceptionally high standards. Rather than lower these standards, we are often forced to accept economic penalties.

"The magnitude of such penalties can become completely unbearable in terms of our future aircraft types if we are without necessary ground organization and navigation aids."

The committee pointed out that IATA member airlines have spent, or plan to spend, billions of dollars in new aircraft orders. (Pan American World Airways has made the initial order for U. S. built turbojet transports. Eastern Air Lines and American Airlines have ordered Lockheed Electras and British European Airways will order the new Vickers Vanguard in the turboprop field. Substantial orders for new turbine types are expected from other carriers.)

Economic Penalties

These aircraft are "fabulously expensive," the report said, but potentially can operate at lower seat-mile costs when flown in the most effective manner technically possible.

"Unfortunately," the report added, "we who have that technical responsibility know that there are very few, if any, international air routes in the world today where the standard of air navigation facilities and services will permit us to perform our part of the overall operation efficiently and economically."

The committee listed various factors which force an economic penalty on the airlines, including the need for excessive fuel loads, departure delays, slow handling due to inadequate terminals, inefficient routing or assignment to uneconomic altitudes because of inflexible traffic control, inadequate and delayed weather information and inefficient communications.

The committee estimates that one hour of non-productive flying of a modern aircraft costs $1,000 and points out that, even if non-productive flying amounts to no more than 2% of annual utilization, it will cost the airlines millions of dollars.

Greater Losses Predicted

In submitting the report, Raymond Dupre, Air France Vice President and Operations Director and chairman of the IATA Technical Committee, told the meeting that the airlines can look forward to greater losses than those suffered today because of inadequate facilities and services.

"Without adequate services and facilities," he said, "airline operators will be unable to satisfy the demands of the general public for an expanding air transport service, and I know that I speak for the entire IATA Technical Committee when I say we believe the events of the next few years will confirm our worst fears on the balance sheets of the airlines."

In a review of specific factors involved in air operations, the committee found that the airlines are suffering added economic penalties from the complexities of international air regulation. A campaign is being planned to bring international aviation law up to date and to keep it in step with technical advances.

An example of backward regulation cited by the committee is the fact that one country requires an airline to carry a radio operator in a day when the radio-telephone has replaced radio telegraphy, and there is no need for the required operator.

'Discount Tacan'

The committee urged the world governments to discount the present controversy in the United States over Tacan and to proceed with development of VOR systems. It estimated that it will be between 10 and 20 years before VOR facilities will have to be replaced.

The committee pointed out that Tacan still has to be proven operationally and that the system will need at least a decade of test and development before it can be applied on an international scale.

A growing interest was reported in an entirely new system called Inertial Navigation which is self-contained and independent of the ground. The new system was recently released from security and is being watched closely because of its potential flexibility and independence from extensive ground facilities.

In considering efforts to attain lower operating limits for approach and landing, the committee found that electronic devices have progressed to the point where immediate benefits must come from improvement of visual aids.

Improvement of threshold and runway lighting is viewed as the most pressing need. It was pointed out that such lighting improvements are also necessary to raise safety standards at current minima.

The committee said it is helping the aircraft manufacturers build better landing characteristics into their products in an effort to relieve the pilot during the critical landing period.

Full Control Recommended

Revision of flight rule criteria to bring them up to the standards of today's faster aircraft was discussed by the committee. The group concluded that the ultimate solution is full control of all air traffic at all times. Since this, obviously, is some time away, the report recommended enlargement of visibility and distance from cloud criteria to allow the pilot of a 300 mph. aircraft a theoretical period of half a minute to see converging aircraft and take action.

The need for streamlining weather procedures to bring them up to the requirements of longer flights was also reported by the committee. As aircraft which can fly 5,000 and 6,000 miles nonstop become available, the IATA group said, it will be necessary to eliminate complicated procedures and adapt them to longer range operations.

The committee noted that the International Civil Aviation Organization has completed the Meteorological Annex to the Chicago Convention and views the annex as a vital statement of meteorological needs and obligations which will aid the airlines in getting the services they need from the various governments.

In communications, IATA is trying to promote standardization of radio-

telephone procedures, since it has become the accepted medium of communication and "the Morse key of radio telegraphy is fast becoming obsolete and will soon become a museum curio."

The committee said that the electronic equipment carried in many aircraft is not adequate to the work required of it, especially in terms of limitations of the number of channels and frequency stability.

It was pointed out that aircraft must have modern equipment in order to take full advantage of ground aids.

The airlines were cautioned by the committee not to make the mistake of thinking that airborne radar is "the nostrum of all navigation and safety ills."

They were advised to stay fully aware of radar's limitations but, at the same time, to take full advantage of its value in increasing passenger comfort and as an additional navigational aid.

It is the hope of the committee that a 1956 ICAO Air Navigation Conference will extend the "approved organization" concept to maintenance personnel which is now applied to overhaul activity. Undert this concept, an entire maintenance and overhaul facility would be licensed by a government rather than licensing of individual personnel.

Fuel Restrictions Hit

Restriction of the use of current types of turbine fuel, such as JP-4 and kerosene, for use in turbine aircraft is opposed by the Technical Committee. After a two-year study, the airlines have concluded that there is not yet sufficient knowledge within the industry to permit recommendation of a single fuel type for civil turbine engines.

While it is too early to set specific performance requirements, according to the report, "objective operational requirements" already have been established. The committee said that helicopter traffic control is being developed with the super-highway concept, including parallel routing, overpasses and underpasses for cross traffic and clover-leaf systems at airway intersections.

The committee noted progress in regional activity, especially in Europe. Installation of a radio-telephone high frequency communications system which will allow elimination of Morse telegraphy by next July was cited as an important step in the European region.

It also was reported that the North Atlantic Treaty Organization has set up a coordinating agency for civil and air force traffic. Forecasting traffic increases in trans-Atlantic operations, the report noted that IATA members, nonscheduled and military aircraft made 60,000 crossings in 1954 and will probably make 90,000 crossings in 1959.

For the coming year, the Technical Committee will be led by Andre A. Priester, Pan American vice president, as chairman, with Capt. A. V. J. Vernieuwe, vice president of Sabena Belgian Airlines, and Capt. J. W. G. James, British European Airways flight operations director, as the new vice chairmen.

Fare Dispute, Invitation to Russia Highlight Annual IATA Meeting

A dispute over recent fare increases and requests by Western airline executives for Russia to lower the Iron Curtain were the highlights of last week's tenth anniversary convention of the International Air Transport Association.

The convention met in week-long business sessions and received reports from its various committees, including the report on the Miami Traffic Conference at which most first-class fares were raised.

In welcoming the delegates on behalf of the United States Government, Civil Aeronautics Board Chairman Ross Rizley expressed disappointment over the fare increases. He observed that U. S. domestic carriers are receiving good public response to their new $160 excursion fare and predicted that "we will be seeing nonstop transocean flights at that rate or less, in high-speed aircraft."

IATA's new president, Juan Trippe of Pan American World Airways, urged Rizley to take a careful look at the work done at the Miami conference before he or the CAB acts on behalf of the U. S. Government.

In his address, Trippe observed that the international airlines are the instruments best equipped to implement the "Spirit of Geneva" generated at the Geneva conference of the major world powers.

Soviets Invited

Although Czechoslovakian and Polish airlines are IATA members, Trippe noted the absence of a Russian delegation and urged Aeroflot, the Russian state airline, to join the IATA ranks.

He said that such a move "would be timely and convincing evidence on the part of the Soviet leaders that they are really willing to lift, for tourist travel, the Iron Curtain which has so long separated the peoples of the West and the Communist worlds."

Retiring IATA president Max Hymans, president of Air France, told the delegates that the last barrier to international aviation is political—the Iron Curtain. He called it "a challenge to the western ideal of the freest possible circulation of men and their goods—that concept of the fastest transport by the most direct route which led our ancestors to cut the peninsulas and pierce the isthmuses at Suez, Panama, Kiel and Corinth."

Hymans said the ultimate solution to the problem lies in membership of a Soviet airline in IATA. He expressed the hope that it would happen in the coming year and make IATA a truly universal organization.

Western Routes to Moscow?

Several airlines are currently exerting pressure for operating rights in the Soviet Union. European operators would like to link Moscow and other Russian cities with their European systems, and the long-haul operators want to fly to and over the Soviet Union in order to shorten their routes to the Far East.

The IATA traffic conference reported to the delegates on the fare increases announced after the Miami conference this month. The main factor was a series of increases of up to 10% in first class fares on most world routes.

The report said that the increases are designed to cover increased costs of providing added luxury services demanded by first-class passengers. These added services include such features as Sleeperette seats, which will probably become standard for first-class service under the new fares.

Short-term agreements were reached on polar-route fares, but long-term solutions were left to next year's traffic conferences because of the present fluid state of polar operations.

The international airlines failed to reach any conclusions on the no-show problem, which is also unsolved by U. S. domestic airlines. Member airlines are making studies in their areas to serve as a basis for specific action next year.

The IATA executive committee reported that recommendations made to the Facilitation Division of the International Civil Aviation Organization should cut airline costs substantially if adopted and implemented by the various governments.

The recommendations included elimination of the passenger manifest, more expeditious custom clearance, amendments to crew license and certificate to help interchange operation,

SIR ELLIS ROBBINS, Central African Airways Chairman (left picture), and Piers Winbush, Central African's general manager, read IATA Daily published by Aviation Week. At right, IATA members in session.

FIVE OF THE MEN who drafted IATA's original Articles of Association. L. to R.: Dr. Henry Gorecki, IATA Treasurer; Prof. John C. Cooper, IATA legal adviser; Maj. J. Ronald McCrindle, BOAC; Rene Briend, Air France, and Per A. Norlin, SAS.

JEROME LEDERER (left) presents Flight Safety Foundation Award to IATA Technical Director Stanislaw Krzyczkowski.

MAX HYMANS (second from left), Air France President and retiring IATA President, welcomes incoming president Juan T. Trippe, Pan American Airways head. At left, Ross Rizley, CAB Chairman; right, Sir William Hildred, IATA Director General.

IATA At The Waldorf

This small plant helps build the world's mightiest bomber

Sounds impossible? It's a fact. This small, neat plant does a big and important job in protecting national security. It is Plasteck, Incorporated, which produces illuminated panels of laminated plastic for the Boeing B-52, mightiest of the world's global jet bombers. The Poteau, Oklahoma, factory employs 125 workers, making it a small business by definition of the Federal Government.

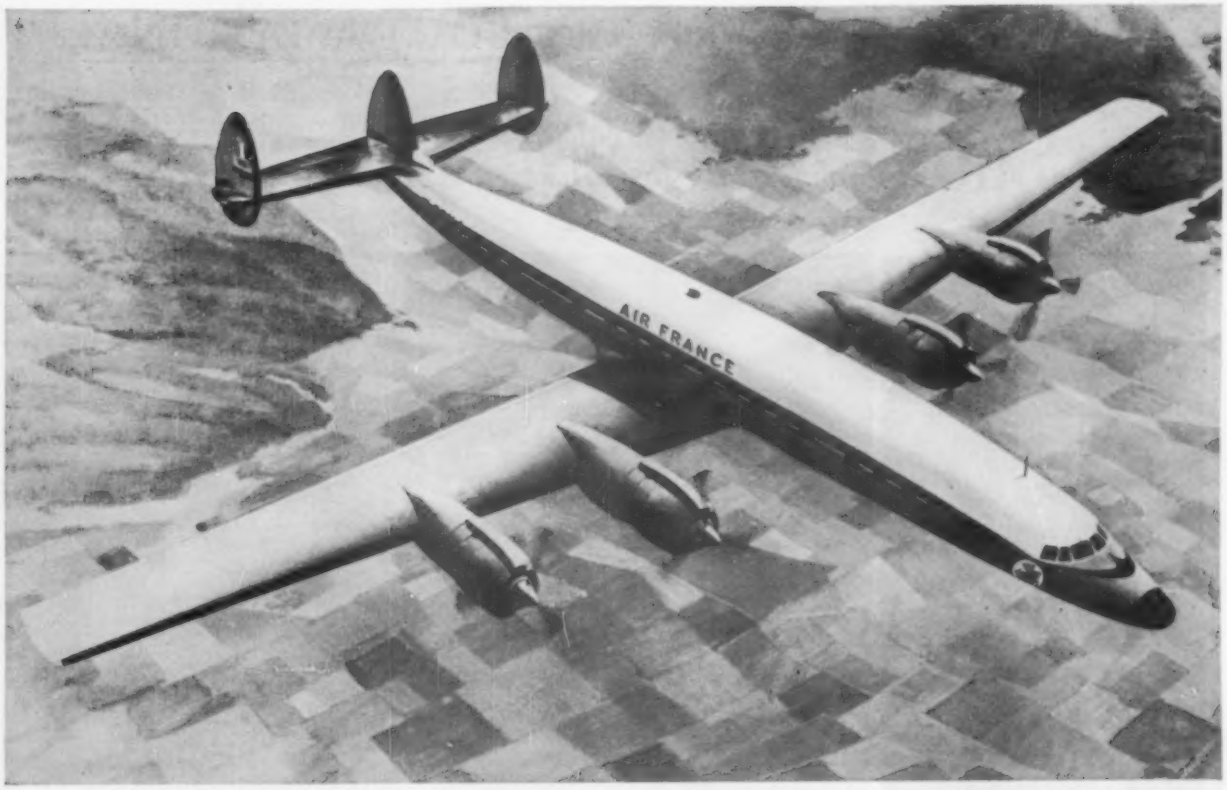
But this plant could as well be a tool-and-die works in Indiana . . . a small and highly specialized manufacturer of aircraft fasteners in Alabama . . . a fabricator of sheet metal parts in California. It could be any one of about 3,500 small businesses, each employing fewer than 500 workers, which are subcontractors and suppliers for the B-52. There are also nearly 1,000 larger firms supplying everything from rivets to complete subassemblies for this "long rifle" of the Air Force.

Many of the small suppliers and contractors for the B-52 also furnish parts and assemblies for other Boeing planes: the B-47 jet medium bomber, the KC-97 aerial tanker, and the forthcoming KC-135 jet tanker-transport. But there are many *additional* suppliers, too, for these planes. Again, roughly three-quarters of them are small businesses.

This network of suppliers—small and large—skilled in aircraft work, provides Boeing, and the nation, an unique flexibility in undertaking new projects, and for quick expansion in the event of a national emergency. In addition, other manufacturers supply equipment for the B-52 and other Boeing airplanes under separate Government contracts: engines, radio, radar, autopilot, armament, and so on. In many cases these manufacturers, too, have their own small-business subcontractors and suppliers throughout the land.

B-52s are now being delivered to Strategic Air Command. As one of the most powerful protectors of our country's security, it is fitting that the B-52 should be a nation-wide project. Small, medium and large businesses in 35 of our 48 states help produce it.

BOEING



Lockheed 1649A

Artist's conception above and wind-tunnel model show extra wing length and high aspect ratio that have helped boost the speed of Lockheed's newest and fastest piston-powered Super Constellation—the 1649A—to above the 400 mph. mark (AW Oct. 10, p. 35). The new, thinner wing is 27 ft. longer (150 ft. from tip to tip) than any of its predecessors. Another change is in the engine placement: they have been placed five ft. farther from the cabin for added interior quietness.

The 1649A model has completed its 1,000 hr. in the wind tunnel, going through close-tolerance checks at speeds up to 570 mph. To gauge any interference between major components, the fuselage, nacelles, empennage, flaps were added one-by-one in the testing.

Lockheed already has received orders from Trans World Airlines and Air France for a total of thirty-six 1649As.

simplification of passenger documents and more attention to facilitation needs in planning new terminals.

The executive committee announced that John Slater, of the consulting firm of Coverdale & Colpitts, will make a survey of the traffic conference machinery. The traffic conference itself had complained of the pressure felt by delegates at the meetings and asked for some relief.

Enforcement Office personnel has been doubled in an effort to make the activities of the office as world-wide as possible. Consideration is being given to the appointment of a permanent chairman in order to give the enforcement operation more continuity and legal cohesion.

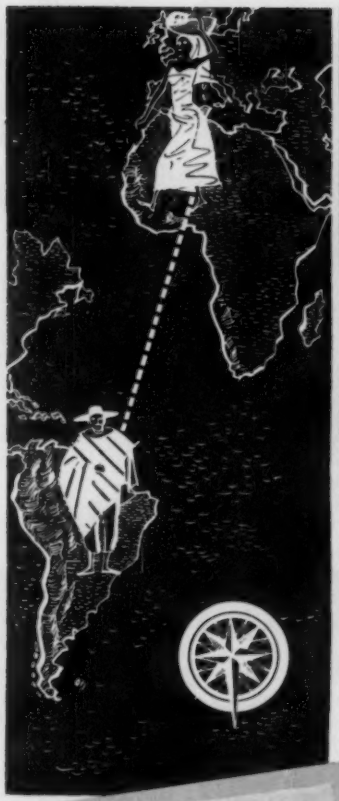
The executive committee told the convention that an IATA prorate agency will be established under the leadership of M. H. Van Pelt, formerly of KLM Royal Dutch Airlines. The agency will handle the accounting problems arising out of division of revenue from interline traffic between the airlines.

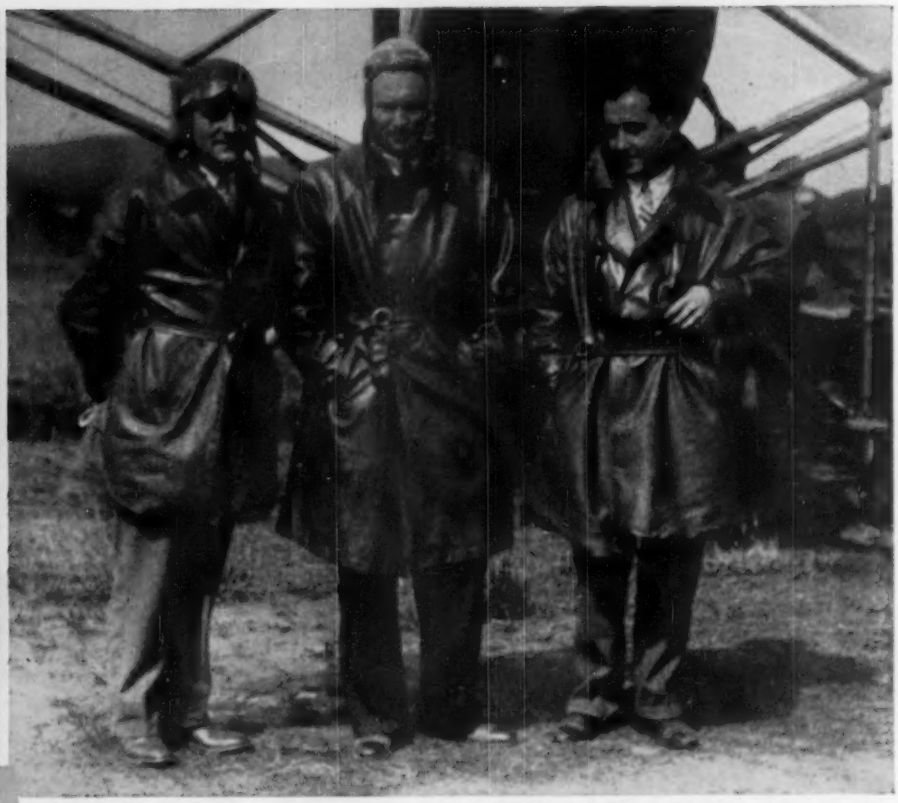
New IATA Members

IATA admitted three new members in the past year—Lufthansa, the German airline; Middle East Airlines and New York Airways, the first all-helicopter operator to join the organization. Seaboard and Western Airlines will become a member as soon as it starts its recently-authorized scheduled cargo operations across the Atlantic.

WHAT DO YOU KNOW ABOUT AVIATION...

Who Navigated the First Commercial Flight Across the Atlantic?



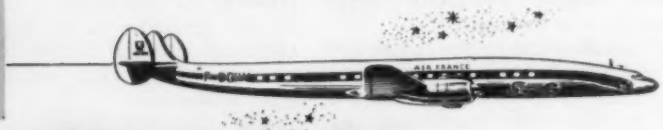


Captain Dabry (right) shown before the historic take-off in 1930. Others are pilots Mermoz and Gimie.

Twenty-five years ago, three men boarded a Latê 28 at Dakar, West Africa. Hours later they were in Rio De Janeiro with their cargo of mail. The first commercial flight across the Atlantic had been completed! Four years later the navigator of this flight made the first regular crossing with the "Rainbow." His name is Jean Dabry.

Today, Captain Dabry still flies the Atlantic at the controls of a Super "G" Constellation. As one of the ranking pilots of Air France, with a remarkable record of 20 years of flying the Atlantic, he typifies the men who have made it possible for Air France to serve the peoples of 76 countries for over 36 years.

Captain Dabry at the controls of an Air France Super Constellation



AIR FRANCE

THE WORLD'S LARGEST AIRLINE

NEW YORK • ATLANTA • BOSTON • CHICAGO • CLEVELAND • DALLAS • DETROIT • LOS ANGELES • MIAMI • PHILADELPHIA • PITTSBURGH • SAN FRANCISCO • WASHINGTON, D.C.
MEXICO CITY • MONTREAL • TORONTO • VANCOUVER • HAVANA • PUERTO RICO

Nonsked Fights CAB

North American Airlines has petitioned the U.S. Court of Appeals for the District of Columbia to make a judicial review of Civil Aeronautics Board's decision in New York-Chicago service case and declare it "unlawful."

The Board turned down applications of North American in the case, but granted new route awards to Capital Airlines, Eastern Air Lines, Northwest Airlines, Trans World Airlines, and United Air Lines, to become effective Oct. 31.

North American's petition declared that CAB's conduct was "arbitrary and capricious and constitutes an abuse of discretion, unsupported by substantial evidence, and unsupported by necessary findings."

More VOR Stations

The Civil Aeronautics Administration has announced that 21 additional omnirange navigation aids will be installed in Europe and Asia, supplementing the 49 VORs already installed or programmed. The VOR installations are being financed by the International Cooperation Administration and by counterpart funds provided by the nations involved. Eleven of the new VORs will be installed in India; four in Pakistan; three in Greece; two in Turkey, and one in Lebanon.

UK Exports by Air

The British America Trade Center reports that produce and manufactured items exported by air from the United Kingdom in 1954 were valued at $169,000,000 and represented 2% of Britain's total exports. Air imports into Britain during the year totaled $119,000,000, or 1.3% of the total. Principal items exported by air, the trade center reported, were silver, platinum and jewelry ($20,400,000 worth), leather and furs ($8,100,000) and scientific instruments, photographic and optical goods, watches and clocks ($12,900,000).

Idlewild Expands

Construction of the International Arrival Building and two adjacent foreign-flag Airline Wing Buildings for the $60-million "Terminal City" development at New York International Airport is scheduled to begin sometime this week. A $697,162 contract was awarded last week to a New York City firm (Wortmann & Sons, Inc.) for the laying of the buildings' foundations. The Arrival Building will house federal services, such as customs and public health, and is scheduled for occupancy in 1957.

OPERATIONS ENGINEERS

Concurrent with the establishment of a Military Relations Department at the Fairchild Aircraft Division, an Operations Engineering organization has been established. The purpose of this new group is to provide technical information for use by Fairchild Military Relations representatives, as well as by personnel in Fairchild's engineering departments. This new group will conduct studies on specific Fairchild airplanes, as well as systems studies relating to possible future Fairchild developments.

The scope of this organization is such that additional engineers are required in the following fields:

Aircraft Utilization
Airborne Electronics
Climatology
Economics
Military Operations
Operations Research
Propulsion

The opportunities and salaries associated with the new positions are in keeping with the responsibilities of this work. Employee benefits in the form of group insurance, individual and family coverage for hospitalization, retirement plan, sick leave, etc., are also provided.

Send complete resume of education and experience, together with salary requirements to:
EMPLOYMENT MANAGER

ENGINE AND AIRPLANE CORPORATION
FAIRCHILD
Aircraft Division

805 PENNSYLVANIA AVENUE

HAGERSTOWN, MD.

ALL REPLIES WILL BE HELD IN STRICT CONFIDENCE.

Guided Missile
Research and Development
Guided Missile research and development is a unique field of scientific endeavor, requiring as it does the concurrent solution of highly complex problems in such areas as guidance and control, aerodynamics, structures and propulsion. The missile activities of The Ramo-Wooldridge Corporation are organized around strong teams of scientists and engineers covering a wide range of specialties. These teams, using the latest scientific and engineering knowledge, and often pushing ahead toward new knowledge, are working in a field characterized by its importance to the national welfare and the high degree of challenge it offers to the qualified engineer and scientist.
Openings now exist for
ENGINEERS AND PHYSICISTS in jet propulsion, thermodynamics, physical chemistry, propulsion system analysis and advanced servomechanisms.
AERODYNAMICISTS for advanced problems in hypersonic flow and aero-thermodynamics.
SYSTEMS ENGINEERS and engineers with experience in servomechanisms, electronic circuits, radar and communication circuits, computers and inertial guidance.
The Ramo-Wooldridge Corporation
8820 BELLANCA AVENUE, LOS ANGELES 45, CALIFORNIA

C-54 to the Rescue

The first of a scheduled 36 SC-54 air rescue planes (above) was delivered to the Air Force earlier this month by Convair's Fort Worth Division. The conversion of a conventional C-54 into an SC-54 includes the installation of blister-type windows in the rear of the fuselage and an oversized nose for special radar equipment. Additional avionic devices and rescue equipment also have been added to the interior.

Lufthansa Plans Route Expansion Middle East, South America

Route expansion plans aimed at reclaiming a large part of the global network it pioneered and operated prior to World War II were announced by Lufthansa German Airlines last week. The airline will resume Middle East and South American routes and inaugurate additional North American schedules during 1956.

Flights to Tehran will begin next summer with an extension planned later to an as yet undesignated Far Eastern terminal. By fall, Lufthansa will again fly between Hamburg and Buenos Aires via Rio de Janeiro. Lufthansa first surveyed Far Eastern and South American routes in 1926.

Service to Montreal and Chicago from Hamburg is scheduled to start this spring.

The expansion plans were announced by Lufthansa President H. M. Bongers, who also discounted rumors that Lufthansa was about to replace its American pilots and other U.S. crew members with German personnel. "These Americans," he said, "are going to be flying with us for a longtime, of course not forever."

U. S. flight captains, on loan from Trans World Airlines, are piloting the airline's transports with Germans as co-pilots. Lufthansa announced that it actually plans to double its number of American pilots before the heavy schedules of next summer. Navigators are on loan from Trans-Ocean Airlines.

Recently, Lufthansa announced that its capital would be raised from $7 million to approximately $18.4 million through a new stock offering. Bongers, however, notes that the West German government now is the majority stockholder and that only recently has private capital shown any inclination to invest.

"The trouble with attracting Europeans is that they want immediate returns on their investments," he said. "Lufthansa is a long range proposition."

A step toward implementation of Lufthansa's route expansion, was the signing this month of an air agreement with France on route exchanges. In addition to traffic routes to cities in France, Lufthansa has French permission to fly via Paris to points in Southern Europe, Africa, South America, the Caribbean, and Ireland to New York. France in return may fly via various German cities to Southeastern Europe, the Middle East, the Far East and Australia.

Northwest to Begin New York-Chicago Run

Northwest Orient Airlines last week announced plans to inaugurate direct service between New York and Chicago beginning Sunday with ten daily flights —four eastbound and six westbound.

With the start of the service, Northwest will offer trans-continental one-stop service across the northern tier of states.

First-class fares between the two points will be $45.10, one way; $85.70 roundtrip, both plus federal tax. Coach fares will be $33 and $66.

Three of the eastbound flights and four of the westbound will be operated on a first-class basis, using Boeing Stratocruisers. Douglas DC-6Bs will be used on the tourist flights.

ARCON

means Automatic Rudder Control. Lear manufactures it. Your dealer sells it. You should be flying it!

NEVER fly in instrument weather without an instrument rating!

(Advertisement)

Aero Supply Mfg. Co. Inc. of Corry, Pa., announces a series of general engineering data bulletins of a non-advertising nature prepared by Aero Supply's Research and Development Center recently established in Cleveland, Ohio. The bulletins consist mainly of technical data with charts, graphs and other valuable information related to the design of aircraft, rocket and missile fuel systems.

The first four bulletins show viscosity vs temperature data for approximately 120 different fluids and have been available since September 6, 1955. The fifth and sixth bulletins will be published in Mid-October, 1955 and show viscosity vs temperature data for aviation fuels.

For over 39 years Aero Supply Mfg. Co. Inc. has been a leading designer and manufacturer of fuel system components, cockpit controls and related articles for all flight applications. Qualified representatives and engineers are readily available upon request to offer assistance on specific engineering and application problems.

Address Request to

Aero Supply Mfg. Co. Inc.,

Research and Development Center,

P. O. Box 402, Corry, Pa.

NO TIME TO WASTE

WHEN THE CARGO

IS LIVES!

USAF HERCULES

The U.S. Air Force now has the ideal airborne ambulance for EVAC-BY-AIR, the Lockheed Hercules C-130 combat cargo plane.

Wherever emergencies happen, the Hercules can go. It takes off and lands in nine times its own length. No long runway is needed because the turboprop power of four giant Allison T56 engines provides plenty of get-up-and-go. And improvised runways, or unimproved fields, can be used because the Hercules has a unique landing gear that distributes its 62.1-ton weight evenly.

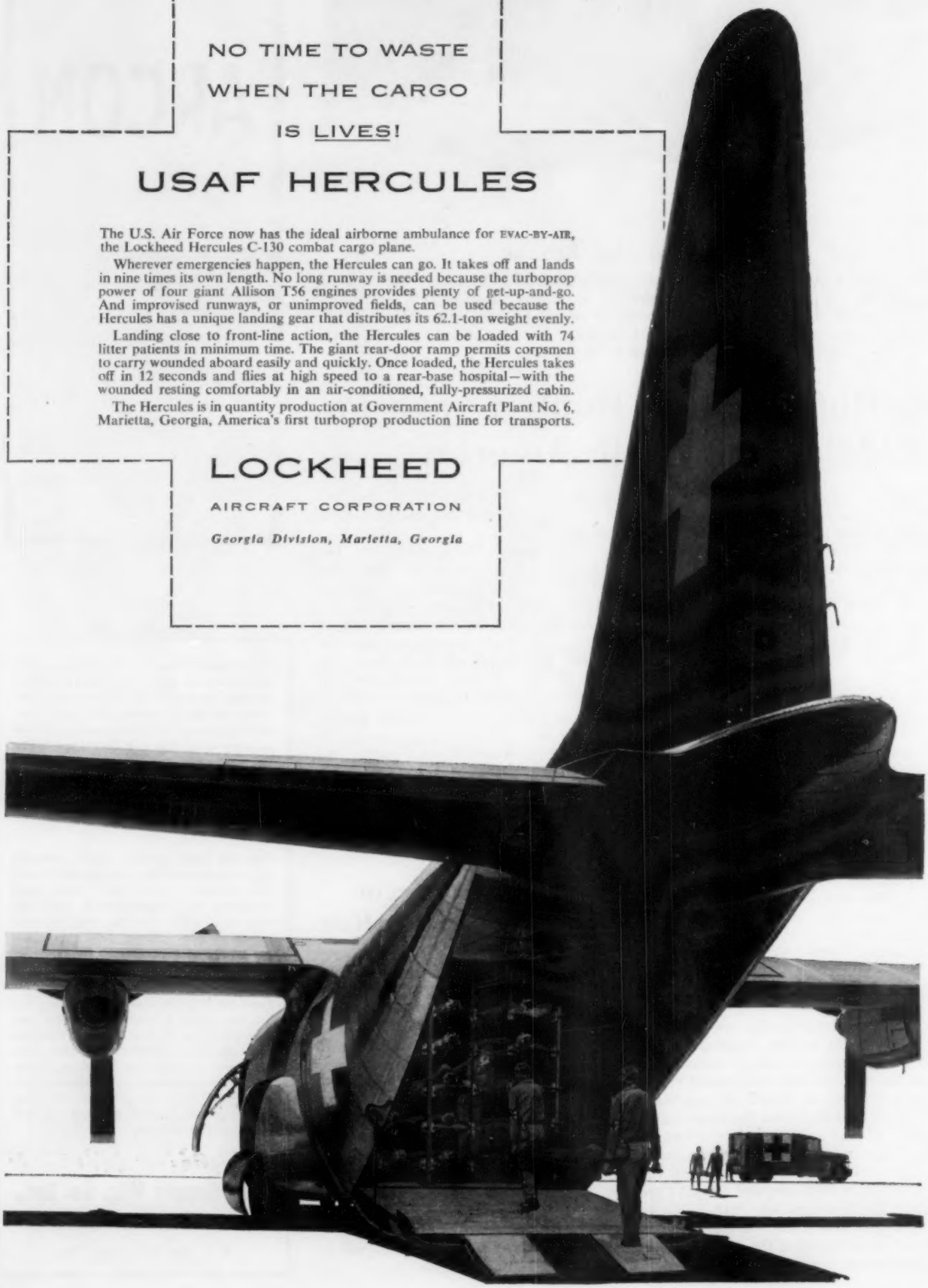
Landing close to front-line action, the Hercules can be loaded with 74 litter patients in minimum time. The giant rear-door ramp permits corpsmen to carry wounded aboard easily and quickly. Once loaded, the Hercules takes off in 12 seconds and flies at high speed to a rear-base hospital—with the wounded resting comfortably in an air-conditioned, fully-pressurized cabin.

The Hercules is in quantity production at Government Aircraft Plant No. 6, Marietta, Georgia, America's first turboprop production line for transports.

LOCKHEED

AIRCRAFT CORPORATION

Georgia Division, Marietta, Georgia



USAF Is Challenged On MATS Policy

Air Force is charged with "inexcusable absence" of coordination in procurement in a report by the Senate Preparedness Investigating Subcommittee.

The criticism is based on investigation of a single case: the procurement of seats for transport aircraft of Military Air Transport Service.

MATS wanted to switch from military-type seats to more comfortable commercial-type seats. When seating replacements were needed for four C-118 aircraft, MATS called on several manufacturers to submit sample commercial type seats. "No authority whatever existed for initiating procurement for this type seat," the subcommittee report declared.

However, it was pointed out that "MATS was clearly encouraged to believe that it would receive authority to install new passenger seats by ambiguous communications from USAF headquarters." The indications were in memoranda from Brig. Gen. John Howe, Director, Maintenance-Engineering, Deputy Chief of Staff for Materiel, and from Brig. Gen. George Price, Director of Requirements, Deputy Chief of Staff for Development.

After MATS and manufacturers "had expended much time and money in the preparation and testing of sample passenger seats," notification was given by Brig. Gen. B. C. Kelsey, Deputy Director of Research and Development, Deputy Chief of Staff for Development, that there was no authority to change from military-type seats.

"This procurement should not have been set in motion prior to a positive and specific determination that a deviation from existing specifications was permissible," the report declared. "It is evident that there existed a lack of proper planning, coordination, and clear channeled communication between MATS headquarters and USAF headquarters. . . . It would also appear that an inexcusable absence of coordination existed between the Office of Requirements and the Office of Research and Development." The subcommittee directed the Secretary of the Air Force to investigate and advise it as to what action is being taken to improve procurement coordination within USAF.

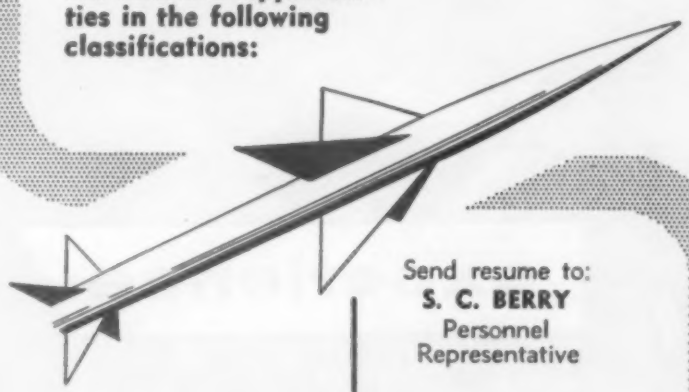
Observing that "small business men who negotiate with the defense forces often come to be filled with a sense of futility in attempting to obtain firm agreements with the services because of frustrations attendant upon long, drawn-out procurement practices," the subcommittee added that complaints it has received "would seem to indicate that this feeling has a substantial basis in fact."

ENGINEERS

DESIGNERS-DRAFTSMEN

BRING YOUR FUTURE UP TO DATE

Join the young men now working in one of the newest, most modern guided missile plants in the U. S. Located in the Appalachian range, Bristol, Tennessee, the Sperry Farragut Company offers qualified personnel excellent opportunities in the following classifications:



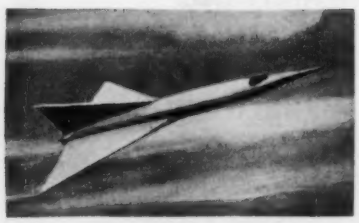
Send resume to:
S. C. BERRY
Personnel
Representative

- MECHANICAL ENGINEERS
- ELECTRICAL ENGINEERS
- ELECTRONIC ENGINEERS
- DESIGNERS & DRAFTSMEN
- RELIABILITY ENGINEERS
- METHODS ENGINEERS
- SYSTEMS ENGINEERS
- PUBLICATIONS ENGINEERS
- TOOL DESIGN ENGINEERS (All Classes)
- INSPECTION METHODS ENGINEERS

LIBERAL EMPLOYEE BENEFITS

SPERRY FARRAGUT COMPANY
DIVISION OF SPERRY RAND CORPORATION
BRISTOL, TENNESSEE

plays a vital role in every success



Pressure actuated switches for every requirement from zero absolute to 12,000 psi. Meletron switches are used by every major manufacturer of aircraft in the United States.

Ice shows have been one of the highly successful ventures in the entertainment world. The respective skills of acrobats, dancers, costume designers and illuminating engineers have been woven into spectacular routines by *experienced* directors. The measure of their success is determined by the number of customers at the box office.

***Experience* plays a vital role in the manufacture of reliable pressure switches. Success in this field is also measured by the number of customers. We at Meletron are proud to number among our customers, every major manufacturer of aircraft in the United States.**

MELETRON® CORPORATION

950 N. HIGHLAND AVE.
LOS ANGELES 38,
CALIFORNIA

J. M. WALTHEW CO., Boeing Field, Seattle 8, Washington; ROUSSEAU CONTROLS Ltd., 2215 Beaconfield Avenue, Montreal 28, Canada; JOSEPH C. SORAGHAN & ASSOCIATES, 1612 Eye Street, N. E. Washington 6, D. C.; J. N. FAUVER CO., 5562 Montgomery Road, Cincinnati 12, Ohio; and Waterville, Ohio; GEORGE E. HARRIS & CO., Inc., 3241 E. Douglas Avenue, Wichita 8, Kansas.

SHORTLINES

▶ **Alitalia** has applied to Jordan for permission to start direct air service between Rome and Jerusalem.

▶ **Lake Union Air Service** of Seattle has received authorization from the Canadian Air Transport board to operate non-scheduled service to Vancouver Island and British Columbia.

▶ **Lloyd Aereo Boliviano** celebrated its 30th anniversary in September. LAB operates 17 aircraft between Bolivia and Argentina and Chile.

▶ **Mohawk Airlines** earned a net profit of $62,400 for the first half of 1955. Passenger revenues were $1,411,224, a 25% gain over $1,129,415 for the comparable period last year.

▶ **National Airlines** declared the regular quarterly dividend of 25 cents per share payable Oct. 14 to stockholders of record Oct. 4.

▶ **North Central Airlines'** net earnings for the first half of this year totaled $41,026, compared with a net loss of $161,787 during the similar period of 1954. Passenger and various other non-mail revenues increased 46% to $1,061,537.

▶ **Trans-Canada Air Lines** will start a new all-tourist service on its southern routes to Bermuda, the Caribbean and Florida. The change to tourist service is accompanied by an overall reduction of 27% in fares and a 32% increase of available seats.

CAB ORDERS

(Oct. 6-12)

GRANTED:

Seaboard and Western Airlines an exemption to provide free transportation to a Curtiss-Wright Corp. engineer on one U. S.-Europe round trip for in-flight observation.

Minneapolis-St. Paul Metropolitan Airports Commission permission to intervene in the North Central Airlines permanent certification case.

Seaboard and Western Airlines an exemption to perform flights from Munich to Detroit and New York, and from Rome to New York pursuant to a contract with the Intergovernmental Committee for European Migration.

United Air Lines, Trans World Airlines, Northwest Airlines, American Airlines, Eastern Air Lines and Capital Airlines exemption authority to make services granted in the New York-Chicago Case effective Oct. 30 so that schedule changes can be made simultaneously with Daylight Saving Time changes.

Riddle Airlines an exemption to operate from Fort Myers, Sarasota/Bradenton, Lakeland, Jacksonville, Daytona Beach and Fort Pierce, Fla., to New York carrying perishable products, live animals and human remains until 60 days after decision in the North-South Airfreight Renewal Case or until U. S. Airlines resumes operations to the points.

State of Ohio permission to intervene in the Erie-Detroit Service Case. Petitions of City of Utica, N. Y., Commonwealth of Massachusetts and the State of New Hampshire are denied.

Permission to intervene in the North Central-Lake Central Acquisition Case to the City of Kalamazoo, Mich., and the City of Gary, Ind.

American Airlines permission to serve Chicago through O'Hare Airport, providing O'Hare and Midway Airport are not served on the same flight.

APPROVED:

Resolutions between various carriers adopted by the International Air Transport Assn. relating to North Atlantic specific commodity rates.

Agreements between Ozark Air Lines, Lake Central Airlines and various other carriers relating to inter-carrier arrangements.

ORDERED:

Suspension proceedings involving certain non-certificated irregular air carriers terminated since they have become moot for various reasons.

National Airlines' petition to reopen the record in the North-South Airfreight Renewal Case on the issue of the holdings of Arthur Vining Davis in Riddle Airlines deferred until after oral argument is held.

Northwest Airlines to show cause why its mail rates for Pacific operations should not be set at the rates proposed by the Board in the International Service Mail Rate Case for the period starting Jan. 1, 1955.

United States Overseas Airlines to cease and desist from violating regularity, ticketing and tariff regulations of the Civil Aeronautics Act and the CAB Economic Regulations.

Letter of Registration of World Freight Forwarders (Air) suspended for failure to file quarterly reports, unless the reports are filed by Oct. 24, 1955.

DENIED:

Allegheny Airlines' petition for reconsideration of the Board's refusal to allow the carrier to intervene in the North Central-Lake Central acquisition case. Permission to intervene in the case is granted to the Airline Dispatchers Assn., AFL; the Air Line Pilots Assn., Intl.; the Postmaster General; the Mansfield Metropolitan Airport and Aviation Commission; the Vermilion County Airport Authority; the Zanesville Chamber of Commerce; the City of Youngstown, Ohio; the City of Columbus, Ohio; the Columbus Chamber of Commerce; the City of Dayton, Ohio; the City of Toledo, and the Toledo Chamber of Commerce.

Lake Central Airlines' application for exemption authority to operate between Cincinnati and Zanesville, Ohio.

let's face the problem of

OVERHAUL COSTS....

There is always a certain attraction about a "bargain" engine overhaul. But what is most important . . . first cost? . . . or final *cost-per-operating-hour?* Do you realize that the 10% to 15% more you pay for a factory authorized Airwork overhaul eventually saves up to 85% of your engine maintenance costs . . . up to 54% of your total engine operating cost? Do you know how much you save by keeping your plane available for service? Here are some typical cost figures compiled by pilots flying Airwork engines:

Engine Type	Total Hrs. Approved	Average Cost Per Flying Hour
R-985	800	3.25
R-1830	1200	3.00
R-2000	1600	2.69
E-185	800	2.22

Factory new parts; factory-identical tools, fixtures and gauges; modernization overhaul procedures — all these make Airwork overhauls costly *at first.* But they *save money for you during the operating life of the engine.*

Twin Bonanza and Aero Commander operators . . . Airwork now overhauls your model Lycoming engines! You can buy or exchange accessories at any Airwork branch office.

Airwork

Airwork CORPORATION

Millville, New Jersey

NORTH AMERICAN HAS BUILT MORE AIRPLANES THAN ANY OTHER COMPANY IN THE WORLD

North American Aviation Has Unequalled Opportunities for

ELECTRONIC, ELECTRICAL, INSTRUMENTATION ENGINEERS and PHYSICISTS

North American offers you major projects, advanced facilities and experienced organization . . . where you can become a key figure in research, design and testing of the electronic and electro-mechanical components that will form the "brains" for airborne vehicles of tomorrow.

You can join the leading company in advanced aircraft design and production. To create a favorable climate for ideas, North American has eliminated the "coordinator." You work on your ideas—follow them through to completion. You may gain recognition for your efforts in the form of Patent Awards and Suggestion Awards.

SPECIAL OPPORTUNITIES:

ELECTRIC MOTOR DESIGN GROUP: A new group is now being formed to design specialized electric motors. This is an unusual challenge for men with fractional H.P. A.C. and/or D.C. motor design experience. You'll work with new metals, new ideas . . . you'll design the electrical motors needed for future aircraft designs.

FLIGHT CONTROLS GROUP: A newly formed section of our Flight Controls Group will tackle special problems of controlling flight stability at supersonic speeds. Openings exist at all levels of experience, including research-directive positions. You'll probe the future in advanced stages of research . . . particularly in the development and testing of high response electrical and mechanical closed loop systems and components . . . in the evaluation of Mach sensors, gyros, accelerometers, force transducers.

ENGINEERING RESEARCH LABORATORY: New positions for all types of electrical and electronic engineers exist at all levels of experience in our Research Laboratory. These positions have been created by North American's leadership in research . . . you will take up where our research has led. You'll work closely with the world-recognized engineers . . . on the team that's engineering ahead for a better tomorrow.

Write today for more information

Engineering Personnel Office, Attention: Mr. L. W. Stevenson, Department 56-AW, Los Angeles 45, California

ENGINEERING AHEAD FOR A BETTER TOMORROW

NORTH AMERICAN AVIATION, INC.

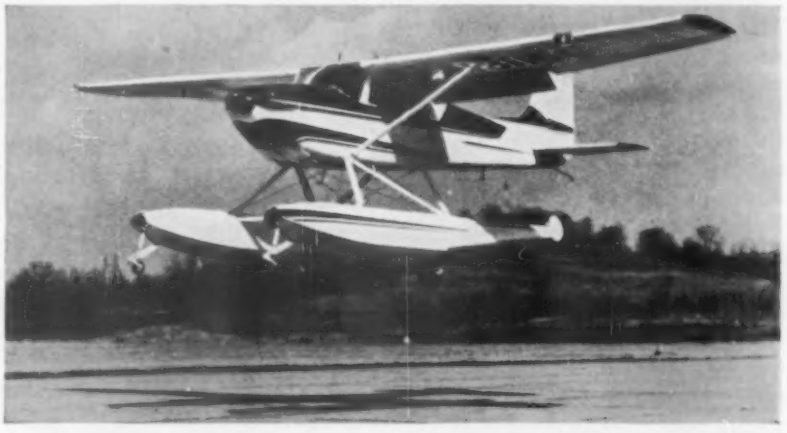
ADVERTISERS IN THIS ISSUE

AVIATION WEEK—OCTOBER 24, 1955

AERO SUPPLY MANUFACTURING COMPANY....115
AEROPRODUCTS ALLISON DIV.,
GENERAL MOTORS CORP.... 82
Agency—Campbell-Ewald Company
AIR FRANCE 112
Agency—Buchanan & Company, Inc.
AIRTRON, INC. 50
Agency—Wehner Advertising Agency
AIRWORK CORPORATION 119
Agency—Gene Wyble Adv.
AUSTENAL LABORATORIES, INC.
(MICROCAST DIVISION) 52
Agency—Gaynor, Colman, Prentis & Varley, Inc.
BELL AIRCRAFT CORP..... 88
Agency—Comstock & Co.
BOEING AIRPLANE COMPANY.....110
Agency—N. W. Ayer & Son, Inc.
BURNS AERO SEAT COMPANY..... 61
Agency—West-Marquis, Inc.
CESSNA AIRCRAFT COMPANY..... 22
Agency—Gardner Advertising Co.
CLINE ELECTRIC MFG. CO..... 56
Agency—The McCarty Company
COAST PRO-SEAL MFG. CO..... 67
Agency—W. B. Geissinger & Co.
COLLINS RADIO COMPANY..... 60
Agency—W. D. Lyon Co., Inc.
CONVAIR A DIVISION OF
GENERAL DYNAMICS CORP.....Front Cover
Agency—Buchanan & Co., Inc.
CONVAIR A DIVISION OF
GENERAL DYNAMICS CORP..... 92
Agency—Thomas L. Yates Adv.
DEAN & BENSON RESEARCH, INC..... 35
Agency—John Phillips Adv.
DUNBAR KAPPLE, INC.
(AIRCRAFT COMPONENTS DIV.)..... 34
Agency—Hanson & Hanson, Inc.
EASTERN INDUSTRIES, INC..... 23
Agency—Remsen Adv. Agency, Inc.
EDO CORPORATION 121
Agency—Davis, Parsons & Strohmeier, Inc.
ELASTIC STOP NUT CORP.
OF AMERICA .....Fourth Cover
Agency—G. M. Basford Company
ELECTRICAL ENGINEERING & MFG. CORP..... 19
Agency—West-Marquis, Inc.
ELECTRO SNAP SWITCH & MFG. CO..... 50
Agency—Gleun-Jordan-Stoetzel, Inc.
FAIRCHILD ENGINE & AIRPLANE CORP. 48, 49, 113
Agency—Gaynor, Colman, Prentis & Varley, Inc.
FLIGHT REFUELING, INC..... 60
Agency—Davis, Parsons & Strohmeier, Inc.
FOOTE BROS. GEAR & MACHINE CORP..... 91
Agency—Waldie & Briggs, Inc.
FULTON SYLPHON DIV.
ROBERTSHAW-FULTON CONTROLS CO..... 78
Agency—Arndt-Preston-Chapin-Lamb & Keen, Inc.
GARRETT CORP., AIRESEARCH AVIATION
SERVICE CO. 24
Agency—J. Walter Thompson Co.
GENERAL ELECTRIC COMPANY..... 66
Agency—G. M. Basford Company
GENERAL LABORATORY ASSOCIATES, INC..... 73
Agency—Riger & Sheehy Adv.
GENERAL MILLS, INC. (MECHANICAL DIV.).... 42
Agency—Batten, Barton, Durstine & Osborn, Inc.
GOODYEAR AIRCRAFT CORP..... 29
Agency—Kudner Agency, Inc.
GREENLEAF MFG. COMPANY, THE..... 44
Agency—Oakleigh R. French & Assoc.
HARRISON RADIATOR DIV.,
GENERAL MOTORS CORP.....105
Agency—D. P. Brother & Co. Adv.
HOFFMAN LABORATORIES, INC..... 40
Agency—Anderson-McConnell Adv. Agency, Inc.
HOLLEY CARBURETOR CO.....Second Cover
Agency—Holden-Chapin-Larue, Inc.
HYATT BEARINGS DIV.,
GENERAL MOTORS CORP..... 67
Agency—D. P. Brother & Company
INLAND TESTING LABORATORIES..... 78
Agency—Merrill, McEnroe & Associates
KAMAN AIRCRAFT CORP., THE..... 86
Agency—Charles Palm & Co. Adv.
KAWNEER COMPANY, THE
(AIRCRAFT PRODUCTS DIV.)..... 37
Agency—Fuller & Smith & Ross, Inc.
KIDDE & CO., INC., WALTER..... 3
Agency—Cunningham & Walsh, Inc.
KOLLSMAN INSTRUMENT CORP..... 54
Agency—Schaefer & Favre Adv.
LEAR, INC.
(LEARCAL DIV.)....33, 43, 57, 71, 78, 83, 91, 115
Agency—Buchanan & Co., Inc.
LIBRASCOPE, INCORPORATED 88
Agency—Western Advertising Agency, Inc.
LOCKHEED AIRCRAFT CORP.....116
Agency—Foote, Cone & Belding
LORD MANUFACTURING COMPANY..... 79
Agency—The Jayme Organization, Inc.
LOUD MACHINE WORKS, INC., H. W..... 32
Agency—Walter C. Davison Co.
LYCOMING DIVISION OF AVCO MFG. CORP...62, 63
Agency—Benton & Bowles, Inc.
MARION ELECTRICAL INSTRUMENT COMPANY.. 33
Agency—Meissner & Culver, Inc.
MARQUARDT AIRCRAFT COMPANY..... 59
Agency—Heintz & Co., Inc.
M B MFG. CO., INC., THE..... 45
Agency—Marsteller, Rickard, Gebhardt & Reed, Inc.
McDONNELL AIRCRAFT CORPORATION..... 76
MELETRON CORPORATION 118
Agency—Welsh, Holland & Coleman Adv.
MICRO SWITCH DIV. OF MINNEAPOLIS-
HONEYWELL REGULATOR CO..... 64
Agency—Reincke, Meyer & Finn, Inc.
MONOGRAM MFG. CO., A DIV. OF
INTERNATIONAL GLASS CORP..... 8
Agency—Taggart & Young Adv.
NEW DEPARTURE DIV.,
GENERAL MOTORS CORP..... 6
Agency—D. P. Brother & Co., Inc.
NOPCO CHEMICAL COMPANY (PLASTICS DIV.).. 70
Agency—Lewin, Williams & Saylor, Inc.
NORTH AMERICAN AVIATION, INC.....120
Agency—Batten, Barton, Durstine & Osborn, Inc.
ORENDA ENGINES LIMITED..... 61
Agency—Cockfield, Brown & Company Ltd.
PHILLIPS PETROLEUM CO..... 4
Agency—Lambert & Feasley, Inc.
PIASECKI HELICOPTER CORP..... 68
Agency—Gaynor, Colman, Prentis & Varley, Inc.
PSP ENGINEERING CO..... 74
Agency—L. J. Swain Advertising
RAMO-WOOLDRIDGE CORP. 114
Agency—The McCarty Company
RAYTHEON MANUFACTURING COMPANY..... 46
Agency—Donahue & Co, Inc.
RED BANK DIV., BENDIX AVIATION CORP..... 26
Agency—MacManus, John & Adams, Inc.
REEVES INSTRUMENT CORP..... 90
Agency—Robotham & Peck, Inc.
REM-CRU TITANIUM, INC..... 10
Agency—G. M. Basford Co.
RESISTOFLEX CORP. 72
Agency—Marsteller, Rickard, Gebhardt & Reed, Inc.
REZOLIN, INC. 25
Agency—Francis D. Gonda Co.
ROBINSON CO., RALPH C..... 83
Agency—Chapin-Damm Adv.
ROE CANADA LIMITED, A. V..... 61
Agency—Cockfield, Brown & Co., Ltd.
ROHM & HAAS CO..... 53
Agency—Arndt, Preston, Chapin, Lamb & Keen, Inc.
RYERSON & SON, INC., JOSEPH T..... 43
Agency—Aubrey, Finlay, Morley & Hodgson, Inc.
SEARCHLIGHT SECTION.....93, 94, 95, 96, 97
98, 99, 100, 101, 102
SENSENICH CORP. 60
Agency—Foltz-Wessinger, Inc.
SERVICE STEEL DIV., VAN PELT CORP..... 77
Agency—Claude E. Whipple Adv.
SOCONY-MOBIL OIL CO., INC..... 30
Agency—Compton Advertising, Inc.
SOUTHWEST AIRMOTIVE COMPANY..... 77
Agency—Don L. Baxter, Inc.
SPERRY GYROSCOPE CO.,
DIV. SPERRY RAND CORP.....Third Cover
Agency—Reach, Yates & Mattoon, Inc.
SPERRY FARRAGUT CO.,
DIV. OF SPERRY RAND CORP.....117
Agency—Equity Adv.
STILLMAN RUBBER CO..... 71
Agency—Lynn-Western, Inc.
STROUKOFF AIRCRAFT CORPORATION..... 27
SUTOBILT CORPORATION 81
TEMCO AIRCRAFT CORP..... 58
Agency—McCann-Erickson, Inc.
UNITED AIR LINES.....106
Agency—N. W. Ayer & Son, Inc.
UNITED STEEL & WIRE COMPANY..... 57
Agency—Goslin Advertising Agency
UNIVERSAL BLUEPRINT PAPER COMPANY..... 91
Agency—Thomas L. Yates Adv.
WEBER AIRCRAFT CORPORATION..... 80
Agency—Charles Bowes Adv.
WESTERN GEAR CORPORATION..... 28
Agency—Ruthrauff & Ryan, Inc.
WHIRLPOOL CORPORATION
(LA PORTE AIRCRAFT DIV.)..... 28
Agency—Netedu Advertising, Inc.
WHITTAKER CO., LTD., W. R..... 36
Agency—Morse-Privett, Inc.

NEWS Edo NOTES

AMPHIBIOUS FLOATS PROVE STAMINA IN USE



Operating on rough gravel strips in the far north of Canada, a Cessna-Edo 180 amphibian has proven the rugged capabilities of the new Edo amphibious floats. Used in connection with the DEW-Line project, the Edo gear withstood grueling daily use with no difficulty whatsoever.

Since its introduction last spring the 180 amphibian, with a cruising speed of over 135 mph, has proven its exceptional performance under a wide variety of conditions. A 180 amphib has even flown from a Colorado lake 8,300 feet above sea level.

Inadvertent landings with wheels retracted have been made on at least five different occasions on both hard and soft runways with inconsequential results. Damage, if any at all, was confined to some wear on the keel strip, after which the plane was in the air within 15 minutes. Land and water landings were subsequently made without hitch.

To meet demand, production of amphibious floats has reached one per day in addition to production of standard Edo floats for Cessna, Piper and other aircraft. For more information send for new Edo float brochure.

Edo
Since 1925
CORPORATION
COLLEGE POINT, NEW YORK

EDITORIAL

Jet Transport Race Gets Hotter

It is certainly no coincidence that the 11th annual general meeting of the International Air Transport Association in New York last week produced the biggest bustle over commercial airline equipment orders since the end of World War II. Never before has the problem of buying the proper type of new transports at the proper time loomed as such a critical problem for airline management. Never before has the international competiton between airframe and engine makers for airline business been hotter. For, as Peter Masefield, who is leaving the airline management field to sell gas turbine transports, recently told the Institute of Aeronautical Sciences in Seattle, the airlines sales game will be played for stakes that could easily total $9 billion during the next decade.

PanAm's Gambit

Ignoring for the moment the domestic picture, Pan American World Airways' recent $269 million order for Boeing 707s and Douglas DC-8s puts the jet transport race on the lucrative North Atlantic route into sharp focus. It now appears that the first turbojet commercial airliners that will link the United States with Europe nonstop in less than seven hours will be built in Seattle and flown by an American flag line. For our British competitors who have been proclaiming their leadership in commercial jet transports for many years, this will be another in a series of disappointments now plaguing their airframe industry.

The Boeing 707 jet transport will go into trans-Atlantic service during 1959, making the nonstop New York to London run in 6 hr. 15 min. Westbound it will be able to make the trip nonstop in normal summer weather but may have to stop for fuel at Gander against the strong westerly winds of winter.

The de Havilland Comet IV, due for British Overseas Airways Corp. service in the same year, could conceivably be used on the North Atlantic, although BOAC's current plans allocate the Comet to Empire routes to the Orient and Africa. On the North Atlantic, the Comet IV would be a one-stop transport eastbound with two fuel stops possibly required when bucking winter winds on the westbound run.

True Measure

Combination of its limited range, limited passenger capacity—58 seats compared to a maximum of 125 for the 707—and a 50 mph. slower cruising speed indicate that the Comet IV will not be an effective trans-Atlantic competitor to either the Boeing transport or the Douglas DC-8 now scheduled for Atlantic service during 1960.

During the IATA meeting we listened to Frederick B. Rentschler, chairman of United Aircraft Corp., advance the thesis that performance of a nation in commercial air transport is a more accurate measurement of its aircraft industry than are claims made for its military airpower. Mr. Rentschler reasons that governments can and frequently do cloak the true measure of their military strength—either to conceal their own deficiencies or to propagandize potential enemies. From our own experience we know this to be a fact.

On the other hand there is no way the facts on commercial aviation can be concealed from public appraisal. The public rides the airlines. It reads the annual airline balance sheets. The public knows if the transports actually do fly, knows their advertised schedules and knows when equipment is earning money for an airline by efficient operation or is swelling a deficit that often must be cured by national subsidy.

Thus, although commercial aircraft performance naturally lags several years behind military achievement, it is necessarily based on the foundation of military development, and it actually provides an excellent yardstick with which to measure the international airpower race, because the facts are plainly visible for all to see.

U.S. Leadership

Looking back on the history of the key trans-Atlantic run, it is interesting to note that pre-war United States airframe and engine manufacturers, teamed with Pan American Airways, were ready to fly this route several years before their international competitors. Operation on the route was delayed several years by political roadblocks designed to give European technology time to pull abreast.

During the post-war years, every transport operating regularly across the North Atlantic had an American airframe, and only a handful failed to use American engines. This is a position of unchallenged leadership of which American manufacturers can well be proud. It also has provided them with the necessary technical experience and understanding of commercial aviation's problems to overcome what was once a five-year British lead in gas turbine powered transports. There is little doubt now that American manufactured transports will continue their dominance of the North Atlantic route and other key international long range routes in the jet age of air transport that will begin in 1959. During the next 90 days, the managements of other major airlines facing Pan American's competition on the North Atlantic route will have to make their decisions on jet transport orders or risk major hazards. We predict there will be a lively scramble this fall to secure firm places on the jet transport production lines of Boeing at Seattle and Douglas in Santa Monica.

—Robert Hotz

HELICOPTER INSTRUMENTS AND CONTROLS DEMAND SPECIAL DEVELOPMENT

. . . they've been getting it at Sperry's Flight Research Center, MacArthur Field

■ One aircraft of the fleet in Sperry's flight research program is the Sikorsky S-55 you see above. This flying laboratory is completely equipped with the latest in helicopter instruments and controls. It is flown by Sperry test pilots, and its crew consists of Sperry engineers who note and record the performance of the instruments and controls under all flying conditions.

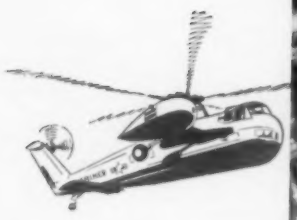
■ As a result of over 10 years' constant flight research in this field, Sperry has now perfected a new flight control system which gives precise automatic stabilization and control of helicopters even under the most exacting condition of hovering. In addition to providing precise control, a new automatic stabilization system relieves the pilot of constant, fatiguing manual manipulations.

■ A helicopter integrated instrument system including a flight director has been developed—and, also, a new engine rpm control.

■ Write our Aeronautical Equipment Division concerning your helicopter instrumentation and control requirements.

SPERRY GYROSCOPE COMPANY
Great Neck, New York
DIVISION OF SPERRY RAND CORPORATION

E B POWER GS
UNIVERSITY MICROFILM IN
313 N 1ST ST
ANN ARBOR MICH



Sikorsky rotor heads stress ESNA

A 16-year fastener field test

How many different stresses are exerted on this rotor head as it controls the cyclic and collective pitch of the five main blades of the Sikorsky S56 designed to transport 26 fully equipped troops? Since it also transforms engine power into forward motion or vertical flight, the stresses add up to an interesting but complicated problem in dynamics. Notice that Sikorsky has solved the fastening problems related to this rotor head design with dozens of standard hexagon and double hexagon Elastic Stop nuts.

They are self-locking, maintain precision adjustments and assure fastener security under the vibration and stress loads normal to helicopter flight.

Sikorsky Aircraft Company had been using Elastic Stop nuts for over a decade before it began developing rotary wing aircraft in 1939. They have been a steady ESNA customer for 27 years and Elastic Stop nuts have been a standard fastener on every new Sikorsky design.

If you recognize the practical value of almost three decades of "flight tested" experience on all types of air frames and engines . . . you'll rely on Elastic Stop® nuts.

ELASTIC STOP NUT CORPORATION OF AMERICA

Department N83-1025 • 2330 Vauxhall Road • Union, New Jersey